the OIL AND GAS JOURNAL

AUGUST 12, 1957

Why Independents Like the Imports Order

. . . . . an interview with I.P.A.A.'s Vaughey and Wood p. 74

★ Oil-Country Tubular Goods Are Going Begging

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★ Rig Activity Is Still Picking Up Abroad

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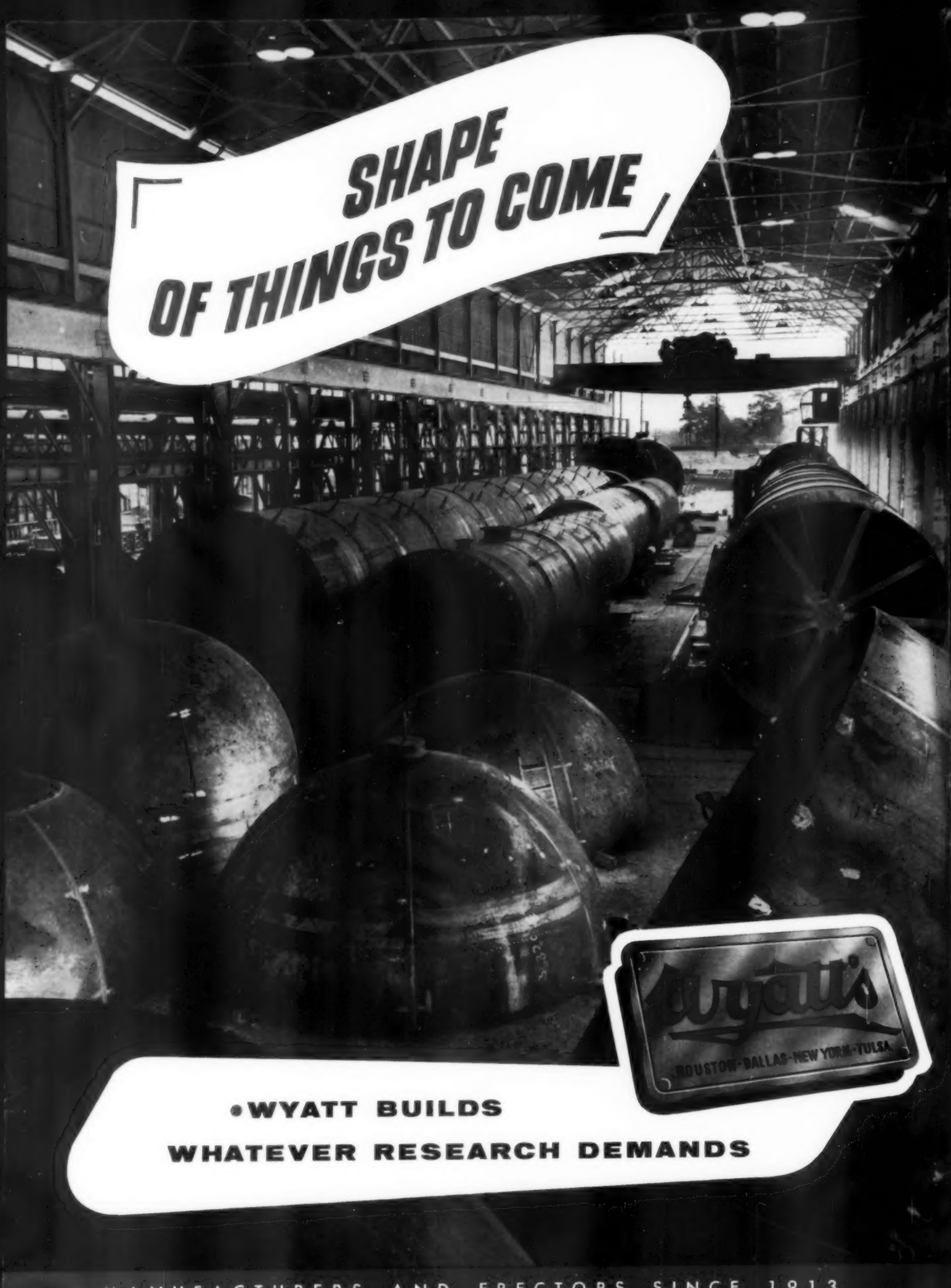
STOCK ADDITIONS SET RECORD . . . See Statistical Section p. 194

New System Gets More From Gas

p. 104


SHAPE
OF THINGS TO COME
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JOURNAL News Letter

Aug. 12, 1957
Tulsa, Oklahoma

Inside story of the Eisenhower imports-control plan:

The Cabinet committee was split 3 to 3 over voluntary compliance versus government control.

This delayed announcement several days after agreement had been reached on the statistical limitation formula. The committee's consultants finally tipped the balance to the voluntary plan.

But it's not as "voluntary" as it looks. The President has plenty of power to enforce the plan, and is ready to use it if necessary. Probably the simplest method: Instruct customs houses not to admit oil in excess of an importer's quota.

Domestic producers, who had been insisting that voluntary plan wouldn't work, have changed their tune. They're quite satisfied on that score now, really don't want federal controls.

Importers also seem to view the "request" as a command. Though not happy, they're all planning to comply. But at least two--Atlantic and Tidewater--will ask reconsideration of their individual quotas. (p. 72).

Oklahoma's Governor Gary will get few tangible results from his barnstorming tour to solicit other oil-state governors to induce Congress to impose mandatory controls on imports and roll them back 50 per cent. (p. 73).

Most governors, Democrat and Republican alike, will be content to let Ike's program run awhile without interference.

But the agitation he'll stir up will be a big psychological boost for the cause of holding down oil imports. He'll keep the pot boiling and let the public know that imports are a matter of serious official concern to a couple dozen important states.

And as this year's chairman, Gary will center the next meeting of the Interstate Oil Compact Commission around the imports question. Coming in December, shortly before Congress reconvenes, this Compact meeting could set the stage for legislation if the new program isn't working satisfactorily by then.

Crude prices won't go up soon, just because imports have been held

down. That's a certainty.

On the contrary, there are many signs of price weakness in the crude market. Crude is being offered without takers in some parts of the Rockies area, and there are rumors of small sales below postings in several places.

Purchaser proration is spreading, notably in Oklahoma, due partly to refinery strikes, more to high production and mounting stocks.

It will take a minimum of 6, possibly 12, months for demand to catch up with supply and work down stocks enough so that the economics of the market can support a higher price structure.

There's an odd legal stalemate in Oklahoma over purchaser proration. If it comes to a showdown it will have an important bearing on the powers of all states over crude production and marketing.

Gulf is holding its August purchases in five states to 80 per cent of actual July runs. This violates a standing order of Oklahoma Corporation Commission that a purchaser must take all of a leases's allowable unless it gets O.C.C. permission.

Other proraters have asked and got exemptions. Gulf hasn't.

Months ago Gulf took this to the federal courts, but lost. The court said it hadn't exhausted its remedies within the state.

Governor Gary wants to crack down on Gulf, to set an example and force buyers to take all Oklahoma crude offered.

But commission attorneys hesitate to move. They can't cite for contempt because Gulf hasn't filed anything. And they can't prove Gulf is prorating until August runs are tabulated--probably late in September. Attorneys for both Gulf and O.C.C. are waiting to see what the others will do.

But Gulf's freedom to refuse to buy is now challenged in New Mexico. The Oil Conservation Commission there has ordered Gulf not to apply its 20 per cent cut to waterfloods or wells making only 10 bbl. per day or less.

You don't need to carry big inventories of oil-country tubular goods these days. There's plenty available. Operators have found this out and are working off stocks and buying hand-to-mouth.

Quick deliveries can be had on practically all steel items needed for drilling and production. The ample supply is due partly to the slump in drilling and the squeeze on producers' income.

But a big factor is deliberate policy of purchasing agents to make supply companies hold the stocks.

Steel men look for supplies to tighten up a bit early next year. (p. 67).

Oil men smile at reports in the popular press that the new Gilsonite refinery in Utah removes the threat of future oil shortage by opening up a vast new resource.

Actually, commercial Gilsonite deposits are estimated at the equivalent of 100,000,000 bbl. of crude oil. That's one major oil field, equal

to about 2 weeks' U.S. consumption.

Real value for the future lies in Gilsonite company's experience with processing methods and equipment which can later be used on other oil-yielding solids such as shale and bitumen sands.

Meanwhile company's profits are expected to come less from gasoline than from byproduct chemicals and premium quality metallurgical coke.

Better control of bit weight--long a driller's goal for straighter holes and more efficient penetration--is promised by a new electronic device to do this automatically. (p. 101).

Previously developed weight controllers were not widely used because of their big size and weight, high initial and maintenance costs.

Growing demand for ethane, fed by expanding demand for many ethylene-based chemicals, can be met easily and economically by simple adaptation of processes long used in field processing plants to separate other natural-gas liquids. (p. 104).

Incidentally, latest official survey shows ethylene is the fastest-growing petrochemical. (p. 76).

Oil-field use of plastic pipe isn't as good as the pipe.

Plastics manufacturers have made much progress in improving their products and particularly in developing performance data.

But petroleum engineers haven't yet learned how to select the most suitable type from the many kinds available, nor how to use it to best advantage under varying field conditions. (p. 106).

A challenge to supply and equipment companies lies in the growing use of air or gas for drilling.

It's now a proved method, but equipment designed for mud needs modification.

Biggest needs:

...Larger and redesigned bit channels and orifices;

...Bits suited to reverse circulation of air/gas;

...Larger anulus in kelly and drill pipe to minimize pressure loss;

...Chemical additives for bit lubrication, foaming agents, and sealing off formation water. (p. 123).

Drillers can now take a side-wall core without pulling pipe.

A new tool operating through the stem brings up a sample in a few minutes.

The corner of Libya nearest the Algerian discoveries is due for a hot oil play.

Once spurned, this remote desert is now under concession by affiliates of Jersey, Shell, Socony, Gulf, Amerada, Francaise, and B. P. Only Jersey is drilling yet, but Socony has a heavy rig on the way. (p. 92).

Foreign drilling hit a record high while U.S. rig activity has been in a slump.

But rig activity has no relation to volume of production, little relation to potential future output.

For example, Germany has more rigs running than Venezuela. Each has six times as many as the whole Middle East. (p. 90).

Deep-drilling records are falling right and left.

Deepest well ever drilled in Texas is now Pan American-Gulf 1 CS University in Pecos County. It's still drilling ahead at 19,078 ft. May go to 1,000 ft. more if there's no trouble with 2,600 ft. of open hole.

This well aimed for the Ellenberger which produces at 15,000 ft. 12 miles away. It hasn't yet found the shallower Devonian.

Oklahoma's deepest hole is now Magnolia 1 Sterba, Caddo County. It's at 19,219 ft., with 4,700 ft. of open hole. May go to 20,000 ft. Aim is the Bromide, state's deepest, and prolific, producer in nearby Grady County.

Meanwhile in Grady County, British-American may add new pays to its fabulous gas-condensate Knox pool. Its 1 Kriger, second field confirmation well, tested shows in second and third Bromide and 90 ft. into the deeper Oil Creek sand at 16,625 ft.

It's now at 16,698 ft. and aiming for the Arbuckle at around 16,750 ft.

That Gray's harbor wildcat really looks like a commercial well--Washington's first.

Sunshine Mining Co. is keeping the hole "tight", but scouts report pipe has been set and it flowed 275 bbl. daily on a 24-hour production test.

Sunshine is hurriedly picking up more leases and is staking three offset locations.

In Alaska, Richfield is drilling and coring below 11,646 ft. on its Kenai Peninsula discovery.

Company plans to drill ahead "indefinitely". Has made no tests since the 200-bbl. per day flow at 11,140-70 ft.

Another discovery for Parodox basin has been chalked up by Carter Oil Co. This one is 10 miles west of Aneth pool.

This is the first Parodox discovery in 2 months, whereas last spring new fields in the basin were being brought in at the rate of one a week. But drilling there is high in anticipation of a pipeline outlet by next winter.

Two strike-bound refineries are back on stream.

O.C.A.W. ended its 90-day strike against Crown Central's 35,000-bbl. Texas plant with settlement of "local issues."

Standard of Ohio reopened its 5,000-bbl. Lima refinery with supervisory personnel. But there's no break in union deadlock which closed all its plants a month ago.

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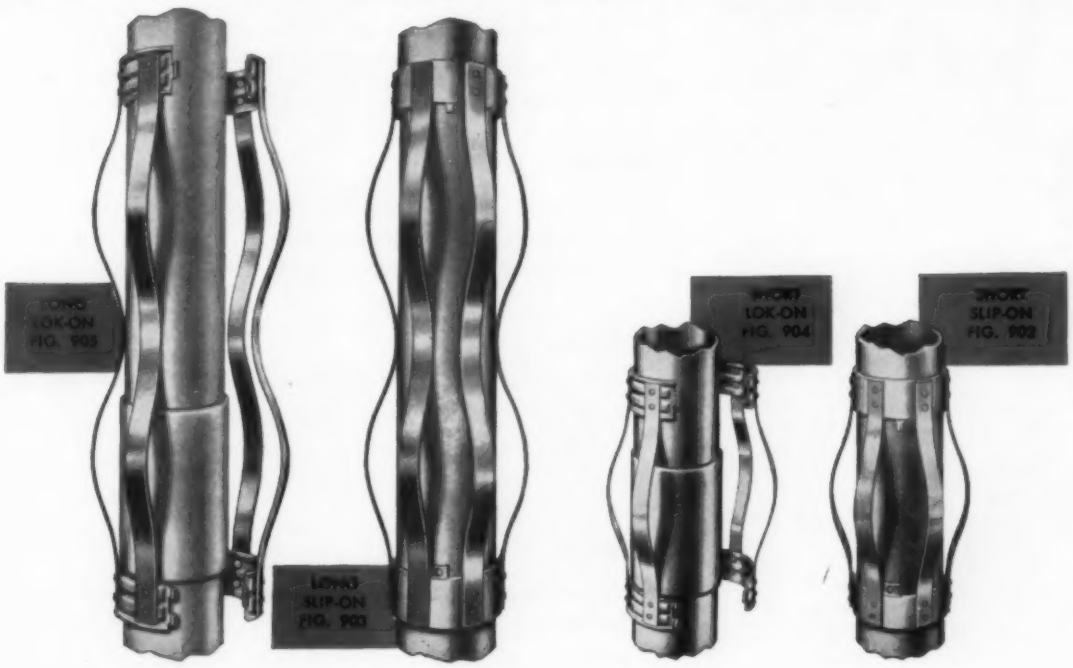

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TECHNOLOGY—OPERATION

Refining-Processing

Alkylation Modification for Increased Throughput 94
By Larry Resen
Modification of the alkylation unit has improved operating conditions and resulted in increased throughput at the El Paso refinery of Standard Oil Co. of Texas. The 1,450-bbl. unit charges olefin with a high proportion of propylene.

Gulfining Units Exceed Design Capacity 99
By Larry Resen
The Gulfining units at Gulf Oil Corp.'s Port Arthur, Tex., plant were designed for 45,000 bbl. per day but have been charging 49,000. The charge stocks, segregated streams of light catalytic gas-oil and West Texas furnace-oil distillate, are hydrogenated with catalytic reformer off-gas.

New Absorption System for High Ethane Recovery 104
By Homer C. Givens
A new absorption system to provide a product gas of about 53 per cent ethane and 47 per cent methane is being put into operation at the Falfurrias, Tex., natural-gasoline plant of La Gloria Oil & Gas Co.

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Pipelining

Emergency Shutdown Equipment Safeguards Compressor Stations 96
By W. E. Warner
Here is the description of a remote-control system which acts on the pull of a lever to shut off the gas supply to compressor, blow down all pressure in the station yard, and at the same time, shut down all operating engines.

Pipeline Patrol: New Microwave System 139
By M. S. Collett
Atlantic Pipe Line Co. recently replaced a key section of its wire-line system in the vicinity of Dallas with a new microwave system. The new system is 170 miles long and interconnects with 1,900 miles of remaining wire line.

Drilling-Production

Drillers Take a Look at Automation 101
By W. C. Gresham, O. E. Mecham, K. J. Ward, and R. H. Ashby
A new automatic weight-control device which overcomes previous objections to this equipment is now available for drilling operations.

Plastic Piping for Oil-Field Use 106
By W D. Greathouse and R. L. McGlasson
Here is a guide to intelligent use of plastic pipe in oil-field operation. Preferred use for each type of plastic—extruded plastics, glass-reinforced plastics, and plastic coatings—is shown, based on maintenance cost, deterioration in service, temperature-strength characteristics, and creep characteristics.

Field Processing—38: Oil-Field Piping System 115
By Dr. John M. Campbell

Air and Gas Drilling Gain Prestige 123
By John H. Adams
Rotary drilling with air or gas as a circulating medium has been highly successful in four wells in the extremely hard-rock area of eastern Oklahoma and northwest Arkansas. An over-all savings of 22 per cent was realized by using air or gas rather than conventional rotary mud.

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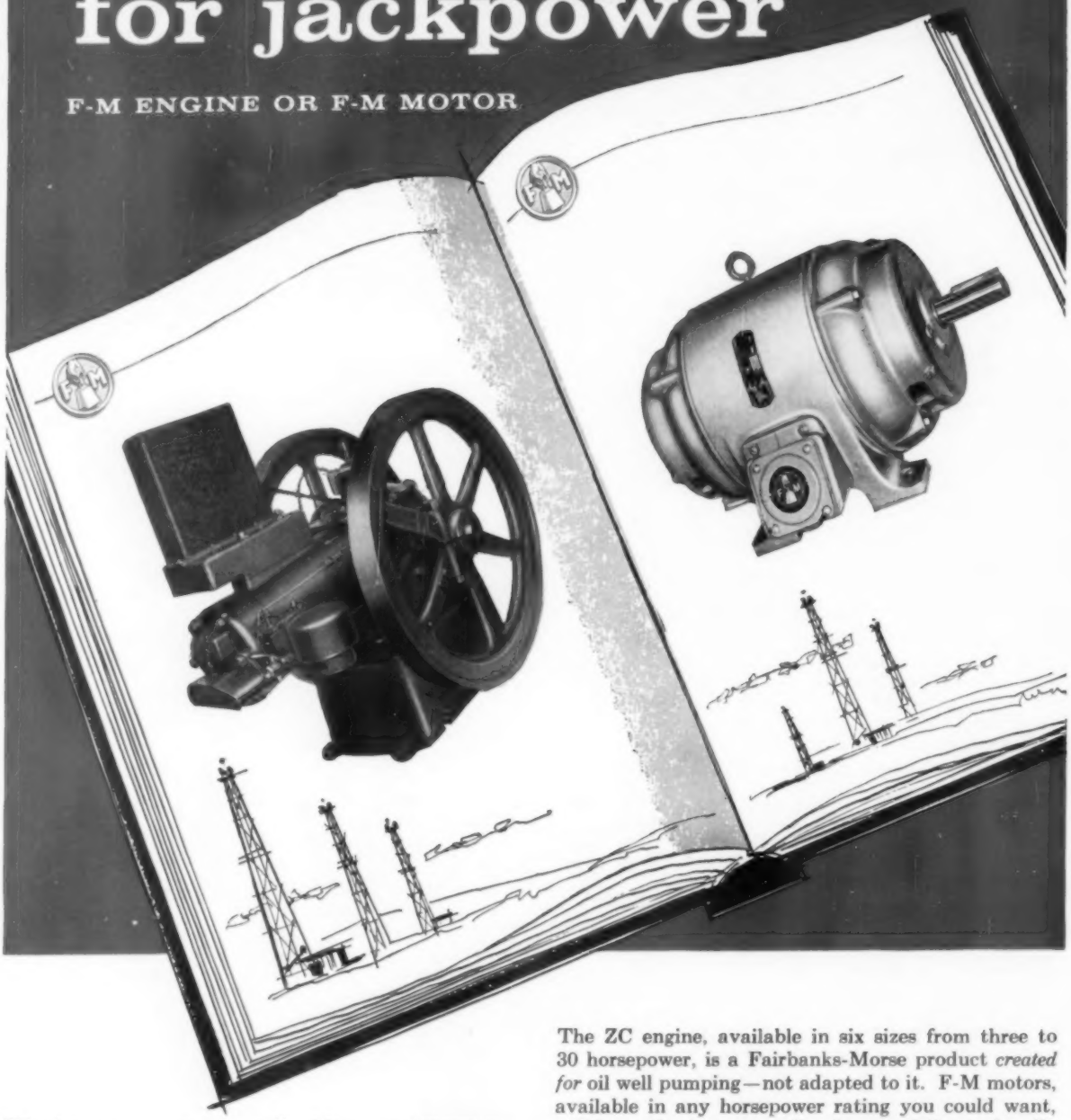

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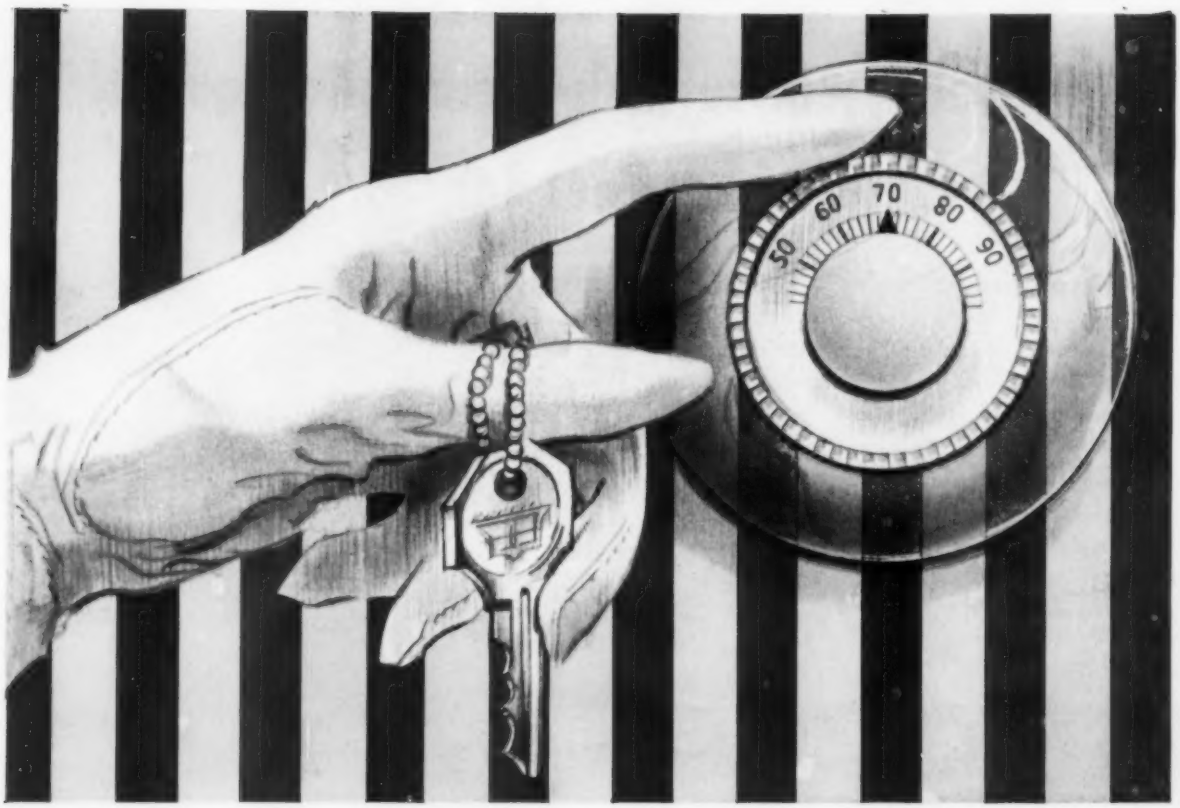

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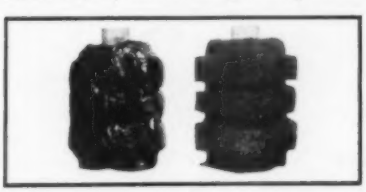

Just look at the difference! Filter on left was used for 90 days with untreated fuel. Filter on right was used for 90 days with same fuel to which FOA-2 had been added.

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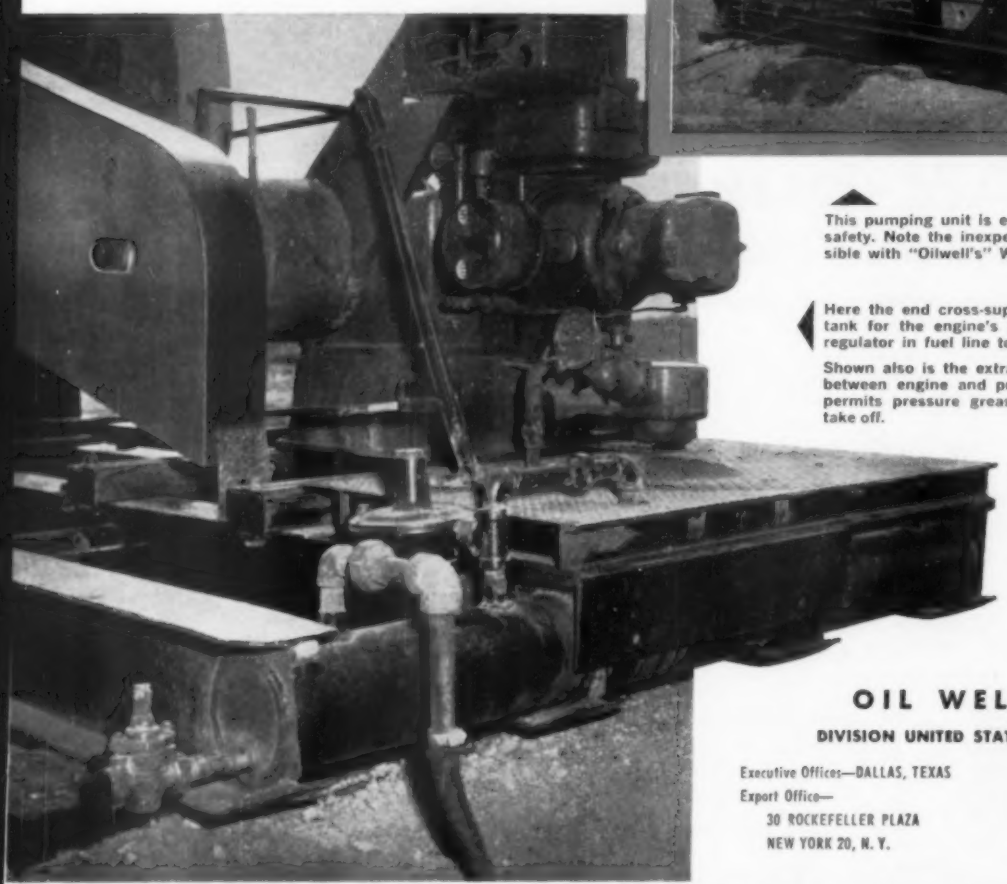
Your "Oilwell" representative will be glad to discuss the incorporation of these or other special features into your next pumping units. Contact him at your nearest "Oilwell" store.



This pumping unit is equipped with crank guards for extra safety. Note the inexpensive grade-and-set installation possible with "Oilwell's" Wide-Base Pumping Unit.

Here the end cross-support was converted into a scrubber tank for the engine's gas fuel supply, with gas pressure regulator in fuel line to the engine.

Shown also is the extra sturdy guard over the V-belt drive between engine and pumping unit gear box. The opening permits pressure grease lubrication of bearings in power take off.

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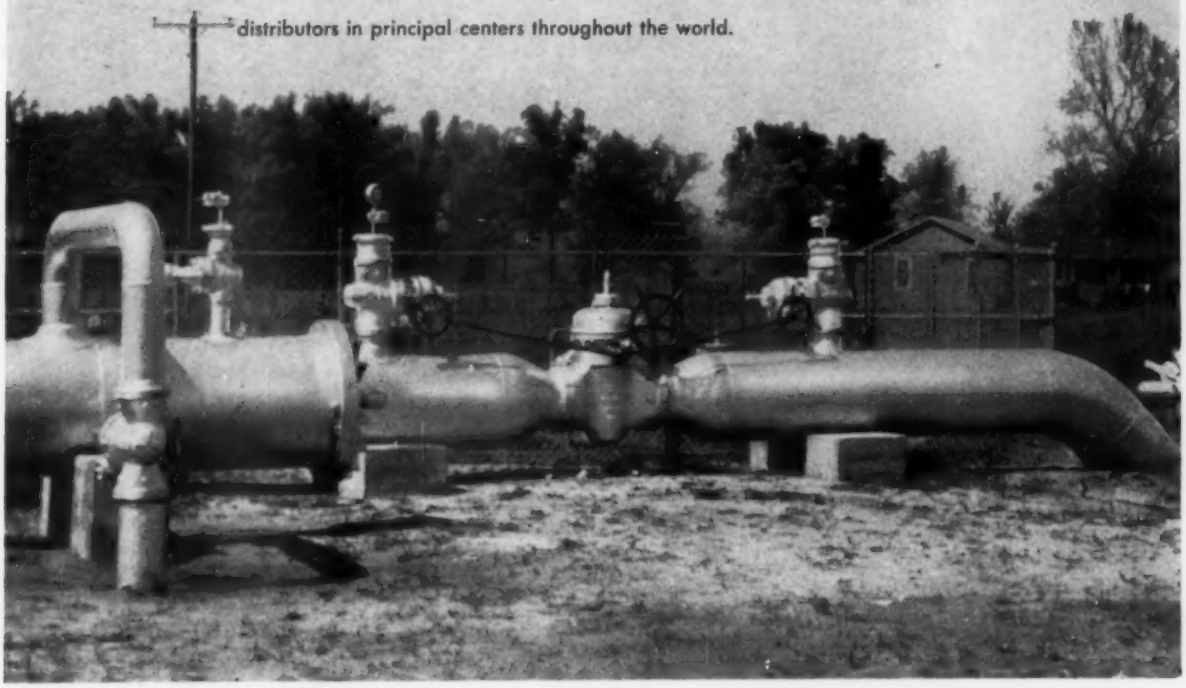

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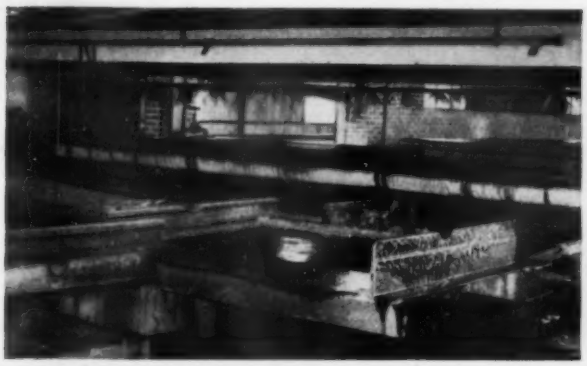
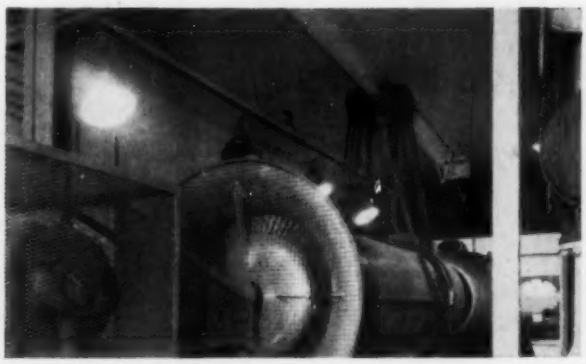


WATER SPRAY PROTECTION Asphalt coating machine at Alabama Pipe Company, Anniston, Ala., has a Grinnell ProtectoSpray System.



AIR FOAM PROTECTION Engine test cell at Trans World Airlines, Inc., Kansas City, Mo., is protected by a Grinnell ProtectoFoam System.

DRY CHEMICAL PROTECTION Hot oil dip tanks at Royal Canadian Air Force Supply Depot, Namao, Alta., has a Grinnell dry chemical installation.

CARBON DIOXIDE PROTECTION Record storage vault at West Penn Power Company, Greensburg, Pa., uses a Grinnell carbon dioxide installation.

Remember, extra hazardous areas, where special protection must be provided to insure against possible serious loss by fire, are fairly commonplace in industry today. Illustrated here are a few of these, along with the fire protection systems recommended to arrest fire. But there are many others, where major or minor supplements to ordinary-hazard fire protection systems are necessary, if trouble is to be averted.

With a full range of equipment, you can rely on Grinnell to give you unbiased recommendations on the system best suited to your requirements. Remember, too, the installation of the proper Grinnell System usually serves to reduce fire insurance premiums drastically, often pays for itself in a few years. So don't delay. For further facts, write Grinnell Company, Inc., 256 West Exchange Street, Providence, R. I. Branch offices in principal cities.

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CHECK VALVES

for freedom from vibration, clatter and piping shock

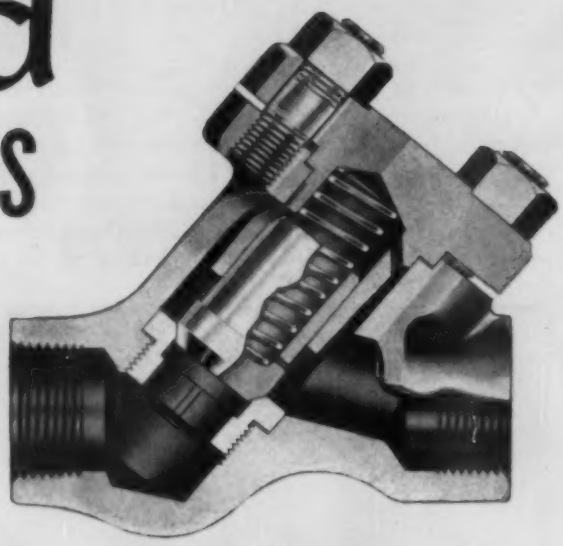


FIG. 4638,5538

For all piping systems requiring small check valves, Edward furnishes a complete line of forged steel valves in both principal check valve types:

PISTON TYPE CHECK VALVES for extra advantage in lines where it is important that the disk closes tightly upon the seat. Careful design of internal parts gives full flow area, low head loss, avoids excessive shock. Exclusive disk guide lip and spring loading for quick positive seating. Available with stellite contact faces on seat and disk on special order.

BALL CHECK VALVES are ideal where heavy viscous fluids are encountered. Bodies are of specially heat treated forged steel. The stainless steel ball of special EValloy high chromium stainless steel is guided by two steel ribs. A spring aids in seating the ball on the carefully lapped seat.

AVAILABLE IN WIDE RANGE OF SIZES AND STYLES

- √ 600, 1500 and 2500 lb sp pressure classes
- √ Horizontal or vertical types
- √ Screwed, flanged or socket welding ends
- √ Union, bolted or welded bonnet
- √ Ball or piston type disk
- √ In ¼", ⅜", ½", ¾", 1", 1¼", 1½" and 2" sizes

GET ALL THESE PLUS FEATURES:

- √ Extra strong and long spring of stainless steel for sure closing action
- √ Rated for 600 lb sp at 850F, 1500 lb sp at 850F and 2500 lb sp at 1000F
- √ Extra strong bodies of specially heat treated forged steel
- √ Cushioned closing action eliminates excessive vibration
- √ Fit any piping arrangement, vertical or horizontal
- √ Corrosion proof stainless steel seats and disks or balls
- √ Accessible removable seats
- √ Easy disassembly if needed
- √ Streamlined body contours for free flow, low pressure drop

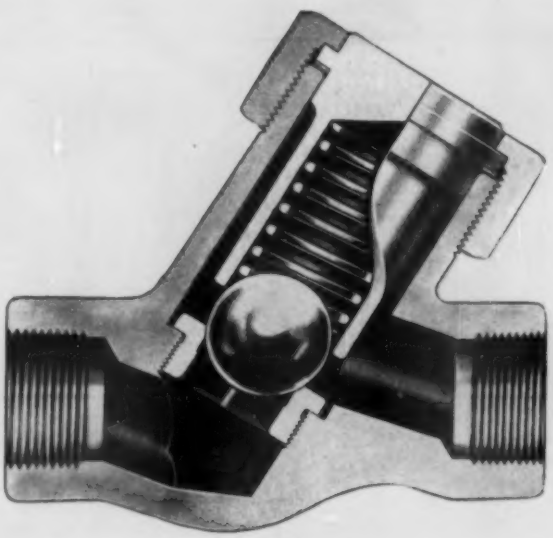


FIG. 2672,3572

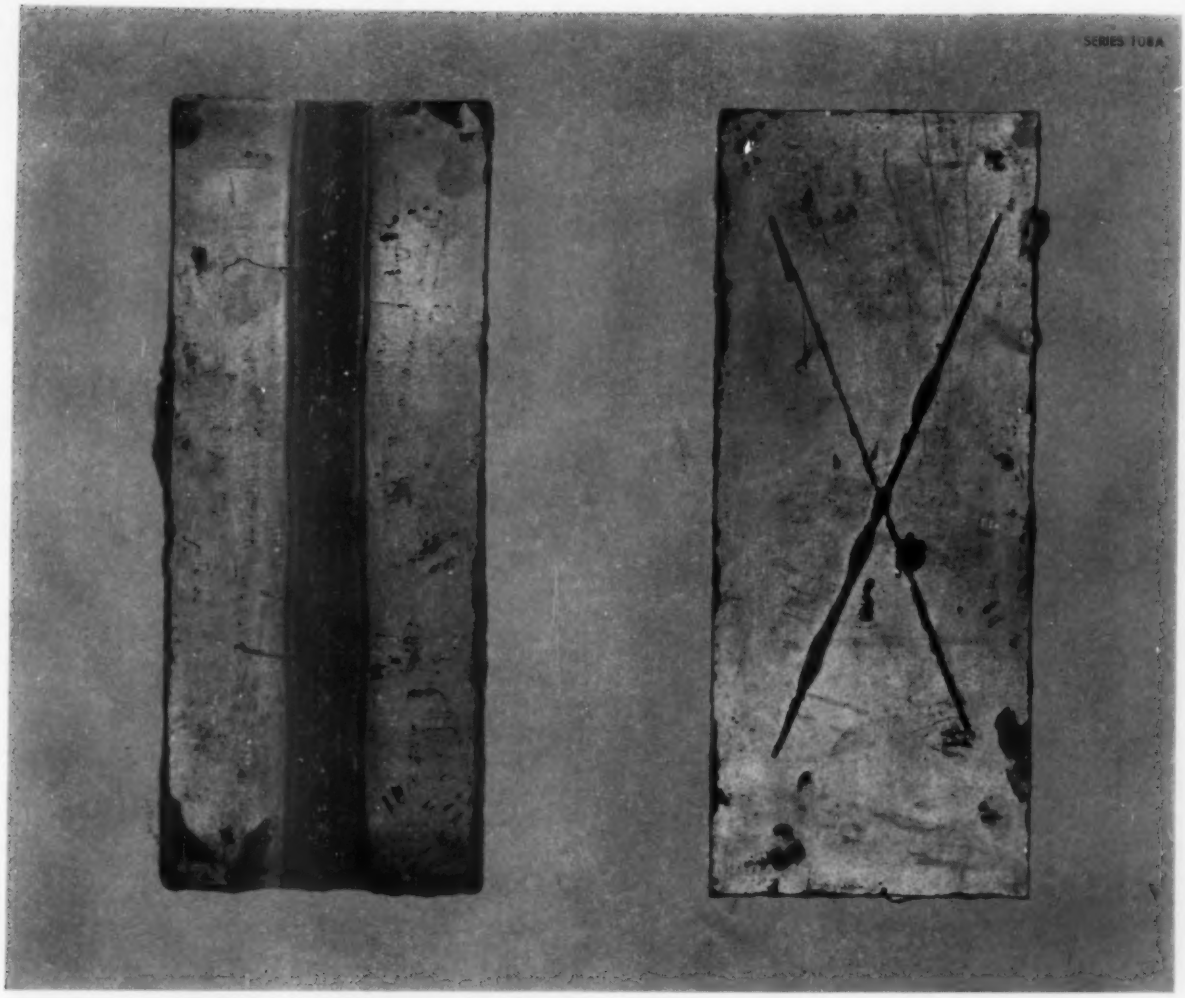
In addition to forged steel check valves, Edward builds a complete line of larger cast steel check valves—there is an Edward valve for every check valve application. Write for complete information.

Edward Valves, Inc.

Subsidiary of ROCKWELL MANUFACTURING COMPANY

1212 West 145th Street, EAST CHICAGO, INDIANA

Another Product



CORROSION'S FOCAL POINTS are easy to detect with a new Amercoat testing method using iron and caustic indicators in a saline gelatin bath. On the welded and scored steel panels shown above after test, unworked surface areas turned red to indicate cathodic properties; but the weld, scores and edges turned blue (here shown blackened) to reveal themselves as anodic corrosion breeders. Rivets, threads, crevices and abrasions also show anodic under test. Unless such areas are effectively sealed from moisture, oxygen and ions they will erupt as focal points of corrosion cells.

How to protect "trouble spots" against corrosion

Ask a corrosion engineer where metal corrosion is likely to attack first. Chances are that he will name rivets, threads, sharp edges, angles, crevices and welds. These are the areas of stress concentration, work hardness, fissures and abrasions. They tend to be anodic and actually breed corrosion. And although they warrant increased protection, conventional coatings pull away from their sharp profiles and leave them inadequately covered.

Amercoat No. 87, a true vinyl mastic, protects these spots in a single coat 10 mils thick, whereas other coatings fail to build 5 mils in three coats. It cuts maintenance painting costs up to 50% because you don't have to re-erect staging and scaffolds for additional coats, and you get results that last.

No. 87 combines the time-tested chemical and weather resistance of vinyl coatings with the thickness of mastic, yet it is easily sprayed with standard equipment over a suitable primer. Available in white, gray, black and aluminum. Use it for enduring protection at lower cost per square foot per year. Complete details mailed on request.—Amercoat Corp., South Gate, Calif.

AMERCOAT Corporation, Dept. CG
4809 Firestone Blvd., South Gate, Calif.

Please send me your latest information on Amercoat No. 87.

Name_____

Position_____

Company_____

Address_____

City_____ Zone____ State_____

Amercoat® CORPORATION

EVANSTON, ILLINOIS • KENILWORTH, NEW JERSEY
JACKSONVILLE, FLORIDA • HOUSTON, TEXAS

Maneuverable BAKER Yardloader truck features 48-inch wheelbase with minimum overhang!

This Baker pneumatic-tired gas fork truck has many outstanding features for more efficient, more dependable yard handling –

It is **FAST** – Top speed with load 8.6 mph.

- **COMPACT** – Only 48-inch wheelbase and almost no overhang.
- **MANEUVERABLE** – Turning radius only 79 inches.
- **STURDY** – Welded box-type frame construction. Heavy-duty industrial gas engine. Rugged Timken industrial truck drive axle. Heavy-duty transmission. Rubber mounted trail axle, fully compensating.

It is **SAFE** – Low Center of gravity for stability. Large self-energizing hydraulic brakes. Independent 2-shoe parking brake.

- **EASY TO OPERATE** – Effortless power steering. Convenient, easily manipulated lift and tilt controls. Padded driver seat – offset for better visibility. Unobstructed access for mounting from either side.

Model illustrated is Baker FGF-40 (4,000 lbs. capacity) with truck-loading mast providing 110-inch lift from 71-inch overall height. Standard model has full 130-inch lift. Single or dual drive wheels available. Other YARDLOADERS in capacities from 2,000 to 7,000 pounds. Write for complete information.

Baker®
industrial trucks

THE BAKER-RAULANG COMPANY
1247 WEST 80th STREET • CLEVELAND 2, OHIO
A Subsidiary of Otis Elevator Company

Otis

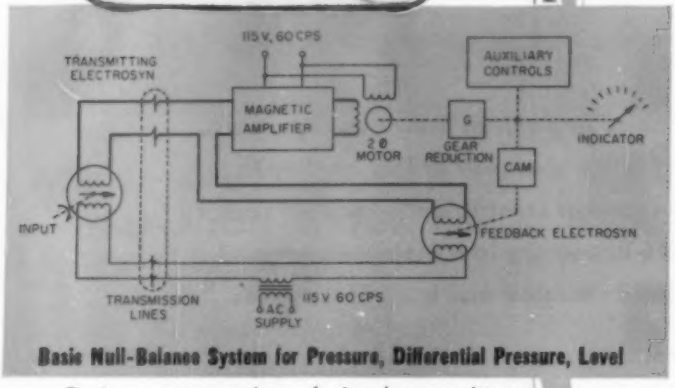
7G6

Cabot pumping units have a lower initial price than their quality would signify, because they are stripped of frills. Because of this quality in workmanship and materials and because of strategically located factory owned repair shops, Cabot units have unusually low maintenance and repair bills. This, plus a record of field stamina and long life, makes Cabot pumping unit cost low.

● Your J & L Supply man will be happy to discuss Cabot's pumping unit line with you.

OIL FIELD PUMPING EQUIPMENT
CABOT SHOPS, INC.
PAMPA, TEXAS
FRANKS DIVISION OF CABOT

ElectroSyn Pressure Transmitter Model 501



Basic Null-Balance System for Pressure, Differential Pressure, Level

Basic system consists of signal transmitter, magnetic servo amplifier, null-balance indicator. (No electron tubes or slide wires.)

In measuring pressure the Model 501 transmitter utilizes a twisted bourdon tube as the pressure sensing element. This tube converts the pressure into shaft rotation of the ElectroSyn, a rotary differential transformer. Output from the ElectroSyn is an a-c voltage exactly proportional to the measured pressure.

Copyright 1957 Detroit Controls Corp.

HIGHer reliability
LOWer maintenance

- *pressure*
- *differential pressure*
- *flow*
- *level*
- *temperature*

ELECTROSYN SYSTEM

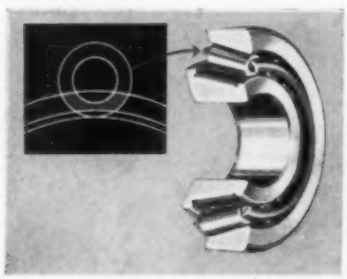
ElectroSyn is a highly flexible, extremely rugged electro-magnetic system for a wide range of applications in the chemical processing, atomic power, natural gas and petroleum transmission fields. It is designed to measure, indicate, record (including analog to digital conversions), or control pressure, differential pressure, flow, liquid level, temperature.

Leading pipeline companies are using ElectroSyn systems for remote indication and data handling of pressures and flows because of system's reliability, flexibility and the fact that it can withstand a static overload of 300% of rated pressure for a 1% zero shift. For complete information write for Technical Bulletin B257.

NORWOOD CONTROLS
UNIT OF DETROIT CONTROLS CORPORATION
942 Washington Street, Norwood, Mass.

NORWOOD CONTROLS

Built to stand up . . . under 'round-the-clock pressure!



HIGHER FLANGE IMPROVES ROLLER ALIGNMENT

As shown by the gray area above, the higher flange provides a large two-zone contact area for the roller heads. This greatly reduces wear—practically eliminates "end play". Larger oil groove provides positive lubrication.

The flow of America's vital oil can't be regulated by a time clock! These bobbing pumps work around the clock, around the year—with virtually no attention whatever! Dependable Bower Roller Bearings are more than proving their ability to stand this back-breaking pace—doing it with a minimum of maintenance cost and down-time. That's because important Bower Spher-O-Honed design features, like the one shown at left, have reduced bearing failure to a rarity. Whatever test *you* put them to—tractors, machine tools, jet engines—you'll find that Bower Spher-O-Honed Bearings will last longer and operate more efficiently. Let a Bower engineer show you the many advanced design features and superior quality of the complete Bower line. There are tapered, straight and journal roller bearings for every field of transportation and industry.

BOWER ROLLER BEARING DIVISION
FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 14, MICHIGAN

BOWER ROLLER BEARINGS

THE GRANT CUSHION STABILIZER

The advanced tool for modern drill string stabilization

- permits **more weight** on the bit without increased hole deviation
- keeps drill collars **centered** and **rotating** freely
- **reduces torque** to the minimum
- gives **longer work life** with more efficiency and maximum **safety**

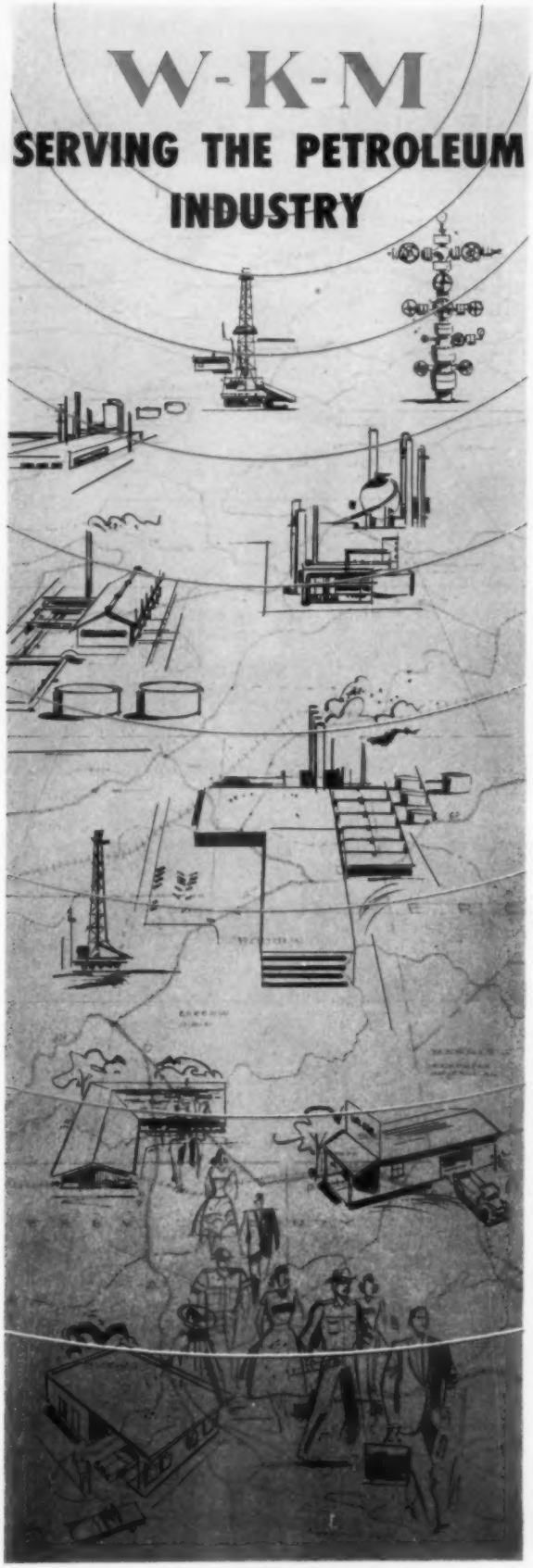
For the full story, request Grant Bulletin 63 and the free pocket-size booklet, "How to Avoid Crooked Hole."

GRANT
OIL TOOL COMPANY

Main Office and Plant

2042 East Vernon Avenue • Los Angeles 58, California

Branches in all the Principal Oil Centers



...*From Rig to Retail*

W-K-M products serve the petroleum industry every step of the way — they control and direct the flow of petroleum more efficiently, more economically, at the well; in the field; in refineries, processing and recycling plants; all along the pipelines; in compressor and pumping stations; and in distribution systems for homes, industries and even the corner filling station.

Whatever the phase of the industry you are in, you will find a W-K-M product to meet your requirements. Write W-K-M for further information to help you select the products that apply to your operation.

W-K-M ® Through-Conduit Gate Valves for oil field service 2" to 4", 500 psi to 15,000 psi working pressures.

W-K-M Process Valves 2" to 30", ASA 300 lbs., 400 lbs., 600 lbs., 900 lbs., 1500 lbs.

W-K-M ASA Through-Conduit Gate Valves 2" to 30", ASA 300 lbs., 400 lbs., 600 lbs., 900 lbs., 1500 lbs.

QCf ® Lubricated Plug Valves with round and rectangular ports ½" to 30", 125 lbs. to 500 lbs. working pressures WOG.

QCf Ball Valves ½" to 6", 150 lbs. to 400 lbs. working pressures WOG.

W-K-M Tubing Slips and Spiders for strings ¾" to 3" O.D. and depths to 15,000 feet.

KEY ® Return Bends.
Available in complete range of sizes, shapes, styles, temperature and pressure ratings.

KEY-KAST Alloy Steel Welding Fittings in tees, wyes, elbows, laterals, reducers, as well as special shapes.

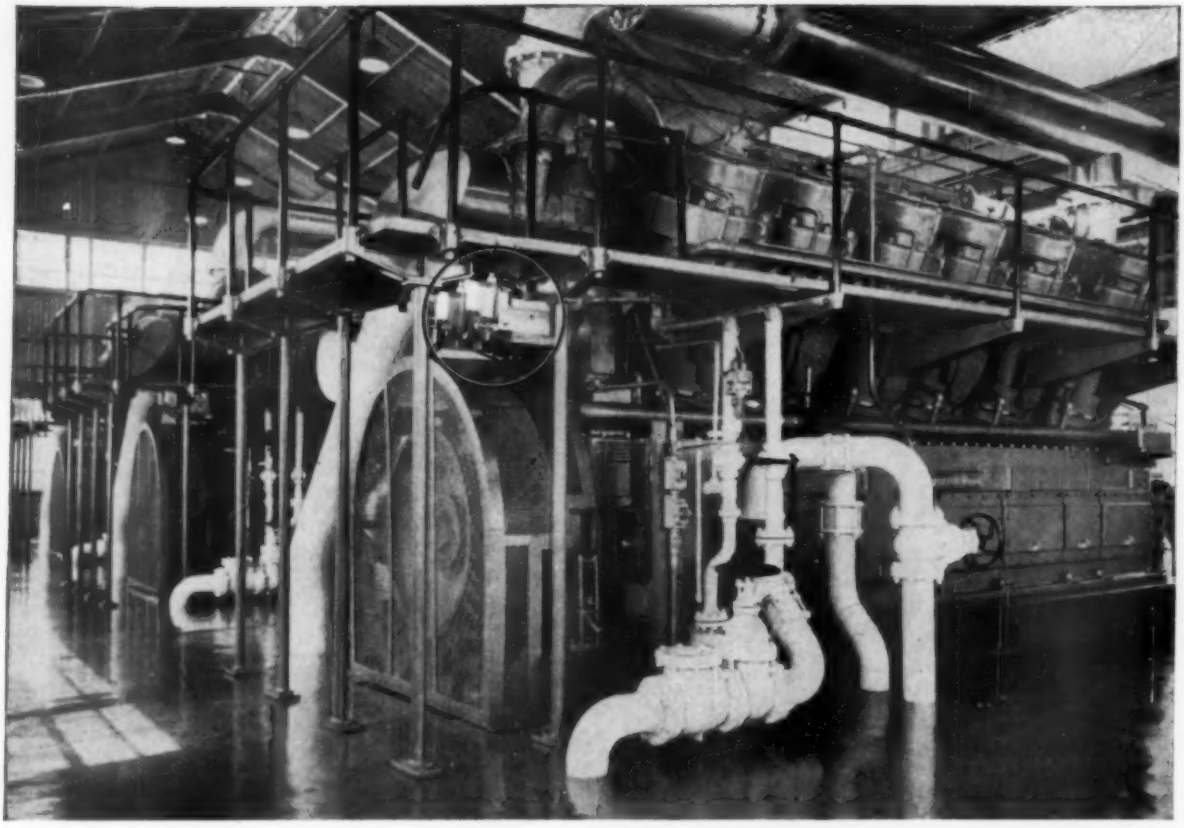
KEY-TITE Waterproof Pipe Joint Compound for lines carrying water, gas, low-pressure steam.
KEY Graphite Paste for lines carrying oil, gas, high-pressure steam.

5718

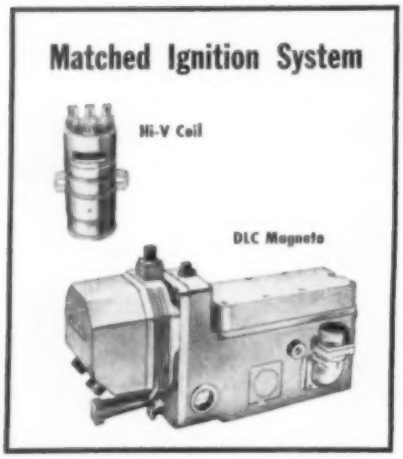
W-K-M
DIVISION OF QCf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

W-K-M, QCf, KEY ARE REGISTERED TRADEMARKS OF QCf INDUSTRIES, INCORPORATED



SERVING TRUNKLINE GAS COMPANY OF HOUSTON —A VITAL LINK IN THE NATION'S ECONOMY!



Trunkline Gas Company of Houston, Texas, operates a natural gas transmission line extending from near McAllen, Texas, to Tuscola in central Illinois where it connects with the line of the Panhandle Eastern Company.

This gas line crosses Texas, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and the southern half of Illinois —a vital link in the nation's economy.

Helping to serve this very important segment of the nation's natural gas transmission system is the battery of Ingersoll-Rand 412 KVS engines equipped with Bendix DLC6 magnetos and Bendix HI-V transformer coils (illustrated at left) in Trunkline's Cypress Compressor Station near Houston.

The Bendix DLC6 magneto is a completely new type of magneto, incorporating the latest engineering design. Together with the Bendix HI-V transformer coil it becomes a matched ignition system that delivers more than ample voltage with greatly reduced maintenance cost.

SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, SIDNEY, N. Y.

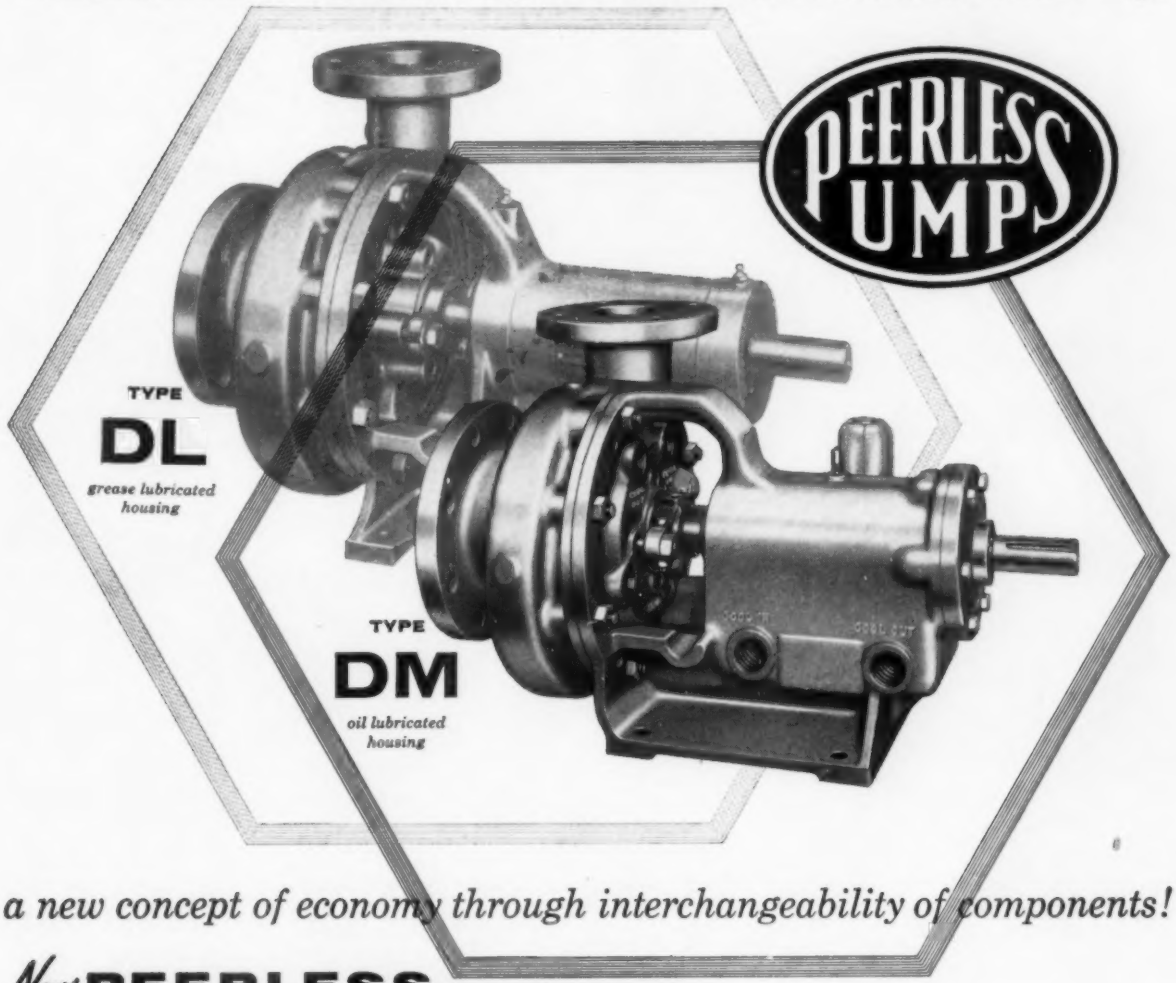
Export Sales and Service: Bendix International Division, 205 East 42nd St., New York 17, N. Y.
Canadian Affiliate: Aviation Electric Ltd., 200 Laurentien Blvd., St. Laurent, Montreal 9, Quebec

FACTORY BRANCH OFFICES: 117 E. Providencia Avenue, Burbank, California • 545 Cedar Lane, Teaneck, New Jersey • Paterson Building, 18038 Mack Avenue, Detroit 24, Michigan • 5906 North Port Washington Road, Milwaukee 17, Wisconsin • Hulman Building, 120 West Second Street, Dayton 2, Ohio • 2608 Inwood Road, Dallas 19, Texas • Boeing Field, Seattle 8, Washington • 1701 "K" Street, N. W., Washington 6, D. C.

Scintilla Division
SIDNEY, N.Y.

Bendix
AVIATION CORPORATION

Mr. Engineer: Cut Your Pump Inventory—Reduce Costs With These New, Proved Pumps



a new concept of economy through interchangeability of components!

New PEERLESS *type* DL & DM PROCESS PUMPS ALSO FEATURE:

ACCESSIBILITY—Through ease of assembly and disassembly if and when required. **DURABILITY**—Through use of any machinable metal as materials of construction. **SERVICEABILITY**—Through designs that feature maximum ease of maintenance. **INTERCHANGEABILITY**—Through a choice of semi-open or enclosed impellers, oil or grease lubrication, air-or water-cooled back plates and bearing housings. **RELIABILITY**—Through the high performance standards set for these pumps, proving more than ever before, that Peerless Builds Dependable Pumps. **AVAILABILITY**—Through shipment from stock of both complete pumps and pump components.

Other pertinent Type DL-Type DM facts:
Peerless Type DL and Type DM process pumps are available in 1″, 2″, 2½″ and 3″ sizes on an 8½″ frame and in 1″, 2″, 2½″, 3″ and 4″ sizes on a 10½″ frame. **CAPACITIES:** up to 800 gpm. **HEAD RANGE:** up to 430 feet. **DRIVES:** motor or steam turbine. **TEMPERATURE RANGE:** grease lubricated housing up to 250°F.; oil lubricated housing up to 450°F. **WORKING PRESSURES:** up to 400 psig.

Write for your New Bulletin now. Use coupon for quick action.

Here is
INTERCHANGEABILITY IN ACTION—

Interchangeability of component parts for DL-DM pumps is graphically shown in this Bulletin. Write for your copy. It shows how liquid end components are accommodated on either grease lubricated or oil lubricated bearing housings. Also provides quick reference to pump specifications and performance characteristics.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Indianapolis 8, Indiana and Los Angeles 31, California
Offices: New York, Indianapolis, Chicago, St. Louis, Atlanta, Lubbock and Plainview, Texas; Fresno, Los Angeles, Phoenix, Albuquerque.
Distributors in Principal Cities. Consult your local Telephone Directory.

PEERLESS PUMPS fmc

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, California

Please send chemical process pump Bulletin No. B-1608.

Name .....

Company .....

Address .....

City ..... State .....

OJG

Here's Why
Oil Men Specify –

EC&M
HIGH VOLTAGE STARTERS

2200-4800 VOLTS
FOR
PRESSURIZED ROOMS
OUTDOORS
INDOORS

left • Type AH Starter (50,000 KVA, certified) for Division 2 Applications. NEMA 3R (raintight) Enclosures for mounting outdoors
below • Diesel loading pump station in southwestern refinery

EC&M Starters are standardized for *easy selection.* They are *easier to install* because they are shipped with all internal wiring complete. They are designed for *easier, faster inspection and maintenance.* And—they *save valuable space* because they are compact with no sacrifice in accessibility.

EC&M's Type AH Starters are available in NEMA 1 or 3R (raintight) enclosures for outdoors, indoors or pressurized control rooms. Three interrupting ratings: 50,000 KVA—POWER FUSED—and VALIMITOR®

Write for Bulletin 8131-C

Five EC&M Aligning Starters with Incoming Line and Feeder Panels for Pumps and Compressors (Pacific Coast Refinery)

Pressurized Control Room with ten NEMA 1 EC&M Enclosed Starters in midwest refinery

THE ELECTRIC CONTROLLER & MFG. CO.
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO

8019

N
12

OVER 45 YEARS EXPERIENCE

TO HANDLE HEAVY HOISTING LOADS

...at maximum speed...with unusual economy

Reserve Powered **BREWSTER N-12**

Designed for rugged deep drilling service, the N-12 has exceptionally high mechanical efficiency over a broad depth range. Already proven on tough contracts from the Gulf of Mexico to West Texas, the N-12 has now set another new drilling record. The world's longest string of casing weighing 719,000 pounds has been run to 15,400 feet by Drilling Contractor Grady Roper with a Brewster N-12.

This example of **"RESERVE POWER"** in action again proves Brewster's known operating efficiency and economy. Compared feature by feature with other top quality drawworks, Brewster, you'll agree, is your best drawworks buy.

Write today for the new Brewster Equipment Catalog.

BREWSTER

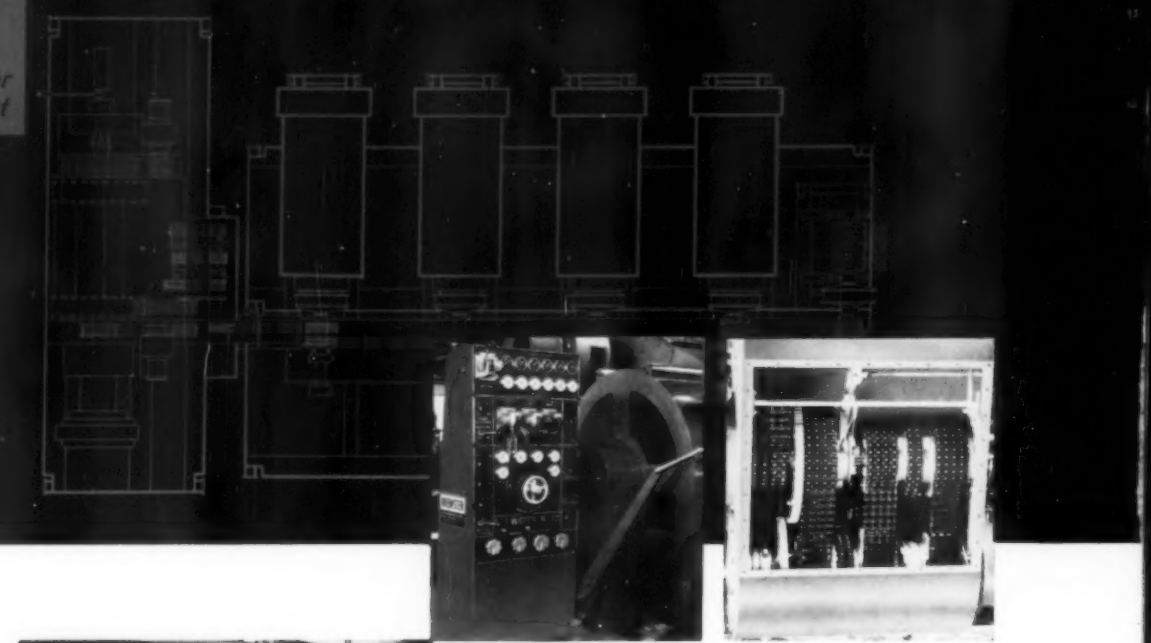
Reserve Powered

FROM DRUM TO PUMP DRIVES

N 12

Fingertip air controls – Full Horsepower at the drum – Chain transmission with four evenly graduated speeds and gear reverse – High and low clutches mounted outboard on main drum providing eight hoisting and two reverse speeds – Rotary drive with four forward and one reverse speed – Dual-in-line pump drives mounted at rear of compound – Choice of engine coupling including fluid coupling and torque converter – Heavy duty box type or sectional compounds for two and three level setups.

Power Layout



N-12 SPECIFICATIONS

Recommended Available h.p.	*1500*
Drum Brakes, Width and Diameter	*10"x54"*
Drum Core, Diameter and Length	*28"x54"*
Transmission Speeds	*4 forward & 1 reverse*
Overall Height	*7' 10½"*
Overall Width	*9' 5"*
Overall Length	*22' 10"*
Approximate Weight	*55,000#*

SUPPLY HOUSES

Howard Supply Company • Apex Equipment Company • Bovaird Supply Company • Industrial Supply Company • Murray Brooks, Inc. • United Supply and Manufacturing Company Export Sales: The Brewster Company • (HOMCO) Houston Oil Field Material Company, New York, N. Y., Houston, Texas; Mexico City, D. F.

Brewster Matched Equipment

Model 500 Traveling Block

8SX Swivel

RSH-27½" Oilbath Rotary

THE BREWSTER COMPANY, INC.
Shreveport, Louisiana

For Dual String Completions – Flowing or Pumping

Use GUIBERSON'S RETRIEVABLE TYPE RD PACKER

Type RD Packer with Anchor and Plain Stinger

This cleanly designed, rugged packer is an outstanding Guiberson development for dual string installations in wells of any depth.

Outstanding in performance because it operates perfectly with both zones flowing, high or low differential pressure; with either zone flowing, the other zone pumping; with both zones pumping; with either or both zones on gas lift; or for multi-zone injection — gas or water.

Outstanding in advantages because it completely isolates each zone from the other and from the casing; provides full opening long string to lower zone; permits either string to be pulled or run separately.

Guiberson's RD packer does complex dual zone jobs so well that operators tell us it's their best investment for dual string production. Ask your Guiberson representative about installation and auxiliary equipment recommendations.

Guiberson's RD packer has smooth operating dovetail slips of heat-treated alloy steel. Packing rubber is one-piece sleeve type — will not vulcanize in the well, made of Guiberson's special oil and gas resistant compound. You can get the RD packer with or without anchor, and a choice of stingers, plain or with snap-ring. Piston slips have extra large gripping area, are heat-treated alloy steel and keyed to anchor body up to maintain proper alignment. Get the Best — Get Guiberson.

THE GUIBERSON CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by Oil Field Supply Stores Everywhere

General Electric announces

New transistorized power supply for two-way radio

General Electric now brings you the vastly improved reliability of transistors — *without obsoleting your present equipment!*

The all-new General Electric Transistorized Power Supply—part of G.E.'s advanced Progress Line—replaces the receiver portion of the mobile power supply and eliminates the receiver vibrator.

Here's what this means: Previously you had to replace receiver vibrators several times a year. Our surveys indicate each replacement costs you from $10 to $18, depending upon service call mileage. Now you can install a power supply costing only $54.50 (when installed in new equipment at the factory, just $44.50) which has the same life expectancy as your entire mobile combination. *The new G-E Transistorized Power Supply will easily pay for itself the first year or two on vibrator replacements and service calls!*

Easy to install—Three mounting studs fasten the new unit to the front of your case or inside the older, two-unit design equipment. Electrical connections are simple: only four leads to attach.

Eliminates "Vibrator Hash" — All traces of the "vibrator hash" which interferes with clear reception are gone for good.

Easily added to any 12-volt system — The new power supply can be used with all standard makes of two-way equipment which operate from an ordinary 12-volt power source.

Saves you money when drivers forget—When drivers neglect to turn off their radios before starting a vehicle, the new transistorized power supply cannot be damaged.

Progress without obsolescence — The addition of the new unit to your present mobiles, no matter what make, improves performance, reduces maintenance cost, and adds to the life of your equipment. *There is absolutely no need to buy complete new mobile units to enjoy the advantages of transistors.*

2-WAY MOBILE RADIO

See for yourself how much you save—buy a new unit or several units and try them in your own 12-volt mobile units. Call your G-E communications consultant, listed under "Radio Communication Equipment" in the Yellow Pages. Or order direct by writing General Electric Co., Communication Products Dept., Syracuse, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

If Your Gas-Condensate Wells . . .

- ✓ Are Extremely High Pressured, . . . or
- ✓ Produce Wax and/or Salt Water, . . . or
- ✓ Have A Pressure Life of 3 to 5 Years . . .

You Need The BS&B COLD-FRAC® . . . Model MDH For Most Efficient And Profitable Production!

IF the wellhead pressure of your gas-condensate wells is 3,000 psi or more, a BS&B Model MDH COLD-FRAC System will probably give condensate recoveries comparable with other much more elaborate low temperature separation systems. Specially designed heat exchanger achieves maximum cooling with minimum pressure drop through counterflow with cold sales gas.

IF your wells are producing wax and/or salt water, a BS&B Model MDH COLD-FRAC System, with its highly efficient Model DC Liquid Knockout, will effectively remove particles 10 microns in size or larger. This inlet knockout handles the maximum rated gas capacity without carryover while handling a normal volume of liquid. Waxy oils and salt water are efficiently removed and bypassed around the heat exchanger and choke.

IF your wells have a pressure life of 3 to 5 years, a BS&B Model MDH COLD-FRAC System will normally maintain the proper balance between initial cost and added recovery. More than 60 standard sizes are available from which to select the unit best suited to your requirements.

Other Types Of BS&B COLD-FRAC Systems...

ECON-O-MAX—for economical application of low temperature separation to small gas-condensate wells.

Model GDH—(with hydrate inhibitor) for maximum condensate recovery from wells having a pressure life of more than 5 years.

Gasoline Plants—for lease location or for central gathering stations.

Ammonia Absorption Refrigeration Units—for producing and maintaining temperatures below zero from energy supplied from natural gas fuel.

See Your BS&B Salesman For Detailed Information On BS&B COLD-FRAC Systems — Or Write To . . .

OVER 60 YEARS BS&B RELIABILITY — ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

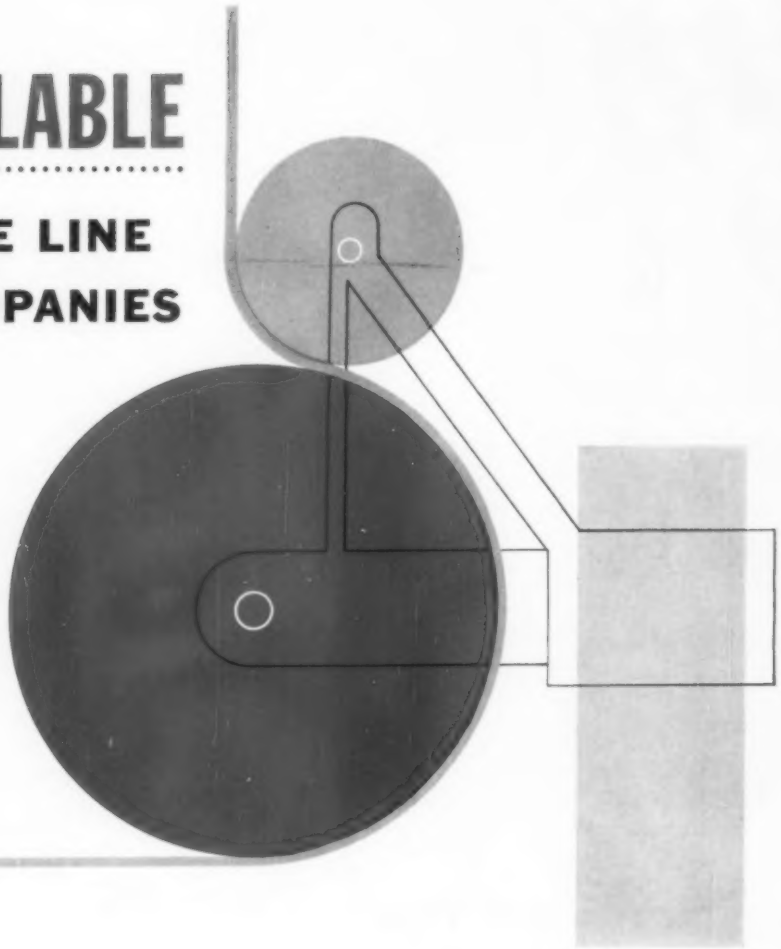
Oilfield Equipment Division, Dept. 1-A8

P. O. Box 1714 — Oklahoma City, Oklahoma

NOW AVAILABLE

TO ALL WIRE LINE SERVICE COMPANIES

Halliburton
Electrical
Wire Line
Service Tools



• **POWDER-TYPE SETTING TOOL**... for electrical wire line setting and operation of these 3 Halliburton tools:

- Halliburton "DM" and "DC" Squeeze Packers and Bridge Plugs
- Halliburton Type "CL" Production Packer
- Halliburton's New Electrical Wire Line Bridge Plug Dump Bailer

Halliburton's Powder-Type Setting Tool has a controlled setting cycle powered by a special blending of explosives that act directly on a piston-operated mechanism. When Packer or Bridge Plug is set, setting tool is automatically disengaged and can be removed from the casing. Easy to make-up on the job due to simplicity of design and construction. Requires a minimum of maintenance.

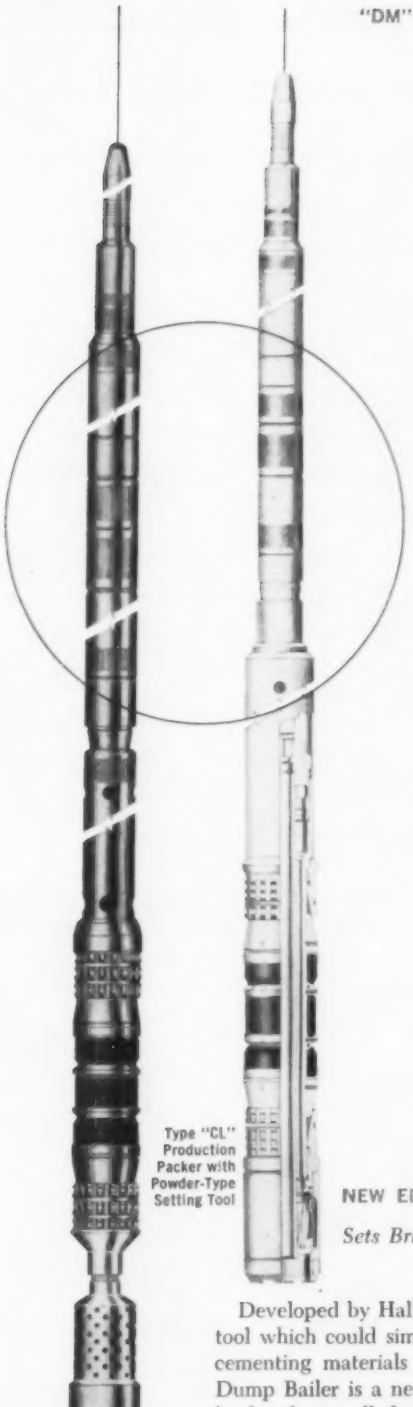
Halliburton's Electrical Wire Line Service tools eliminate the necessity of a round trip with tubing or drill pipe on a wide variety of well operations ... providing these big advantages:

- savings in rigtime
- extra "working life" for tubing and drill pipe
- greater accuracy of placement in the well

Halliburton now offers its unique, time-saving devices... not only through its own 251 Service Camps, but through these additional qualified service companies:

Welex Jet Services, Inc., P. O. Box 11336, Fort Worth, Texas
Independent Perforators, Inc., P. O. Box 186, Stillwater, Oklahoma
Frontier Perforators, Inc., P. O. Box 1678, Pampa, Texas
Wireline, Inc., P. O. Box 454, Williston, North Dakota
Karl F. Edmonds, Inc., P. O. Box 984, Kilgore, Texas
Texas Perforating Company, P. O. Box 1045, Graham, Texas

HALLIBURTON
OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA



"DM"-"DC" Squeeze Packer or Bridge Plug with Powder-Type Setting Tool

Type "CL" Production Packer with Powder-Type Setting Tool

"DM" AND "DC" SQUEEZE PACKERS AND BRIDGE PLUGS...

The Same Reliable Tools as Set on Drill Pipe and Tubing for Thousands of Satisfied Customers for Decades

- for helping prevent movement of gases or fluids from above or below packer
- for isolating a lower zone while testing an upper section... plug may be drilled later or left as permanent plug
- for establishing a bridge below perforated section which is to be squeezed, cemented or fractured
- for providing pressure-tight plug for testing casing or for wells that are to be abandoned

Type "DM" Squeeze Packer is made of high strength drillable magnesium alloy, ideal for either squeezing or for temporary bridge plug. Type "DC" Squeeze Packer is made of high tensile strength drillable cast iron, ideal for either squeezing or for a permanent bridge plug. These packers and bridge plugs can be run-in on tubing and set by simple mechanical action where desired.

TYPE "CL" PRODUCTION PACKER...

For Single or Dual Zone Completions

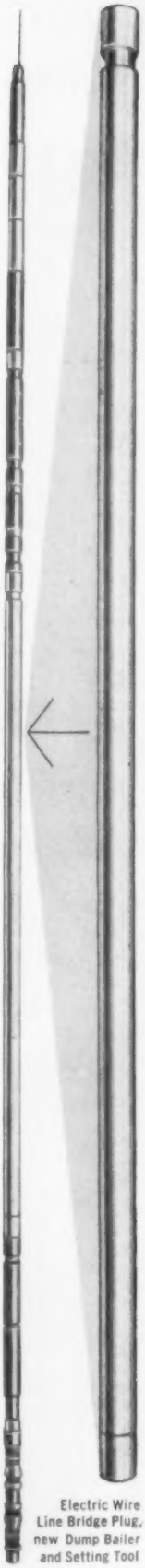
- readily adaptable for gas or water injection wells, and permanent-type completions
- large bore diameter facilitates the use of standard tubing as tail-pipe
- casing below packer can be perforated with tubing-type perforating-gun
- full-opening diameter makes packer adaptable for fracturing
- made of drillable material, designed to withstand up to 10,000 psi differential pressure

The Type "CL" Production Packer is similar in design and effectiveness to the Type "C" Production Packer, which is run on tubing or drill pipe and is well-known in the industry for reliability. For dual zone completions, two Type "CL" Production Packers or one Type "CL" and one Type "C" Production Packer may be used for producing either zone selectively.

NEW ELECTRICAL WIRE LINE BRIDGE PLUG DUMP BAILER...

Sets Bridge Plug and Dumps Material in One Continuous Operation

Developed by Halliburton to meet the growing demand for an electric wire line tool which could simultaneously set a bridge plug and dump up to two sacks of cementing materials on top of it, Halliburton's Electric Wire Line Bridge Plug Dump Bailer is a new tool in the industry. Combination of slow burning powder load and controlled setting cycle sets bridge plug, dumps materials, and disengages setting tool and dump bailer in one continuous operation. This unique new tool saves considerable rigtime when it is desirable to dump cementitious materials on top of a bridge plug for any reason.

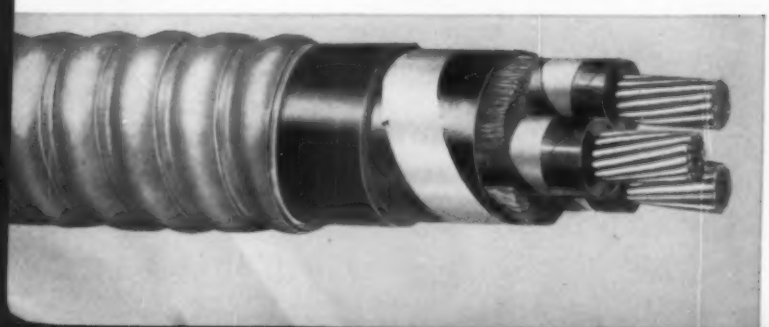


Electric Wire Line Bridge Plug, new Dump Bailer and Setting Tool

ELECTRICAL WELL SERVICES

251 SERVICE CENTERS...JUST MINUTES AWAY FROM YOUR WELLS

Speed new power on old poles—cut costs
with Anaconda Duralox Interlocked-armor Cable



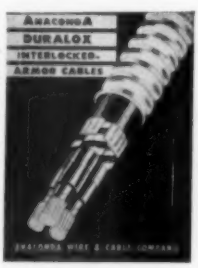
METAL TAPE ARMOR AFFORDS HIGH PROTECTION AGAINST DAMAGE—NO CONDUIT NEEDED.

When a large Gulf Coast refinery needed additional power, the job was done *quickly* and *economically* because Duralox* could be strung on existing power-line poles—below the old lines. Neither new poles nor cross-arms were needed.

Installation time and costs are slashed with Duralox. Outdoors or in, it is readily trained around or over machinery, beams, piping and other obstructions in long, unbroken runs.

Duralox increases plant flexibility, affords easy maintenance and minimizes down time because it is generally accessible, easily relocated—100% salvageable. *Reg. U.S. Pat. Off. 57407

NEW BULLETIN DM 5606 contains full information about Anaconda Duralox Cable. Write for your free copy today. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



Ask the Man from

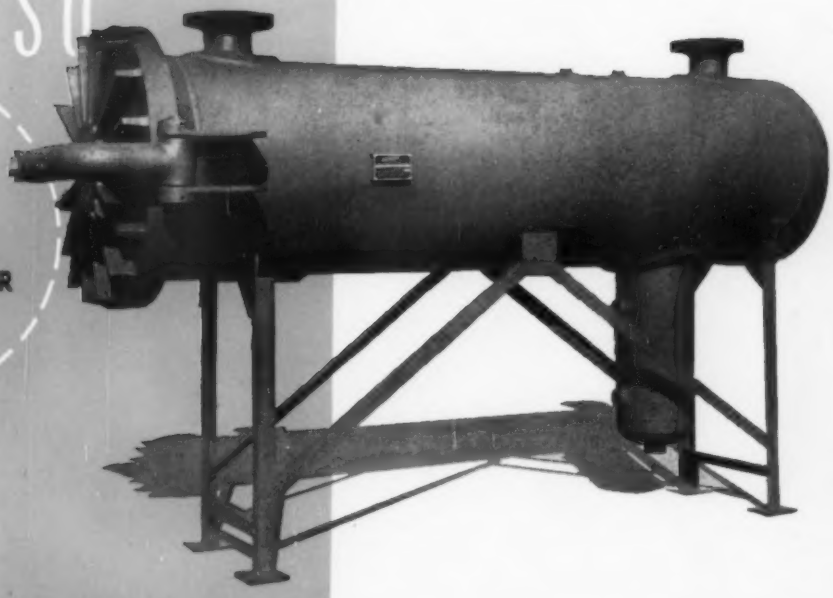
ANACONDA®
for DURALOX CABLE

EXISTING POLES are utilized at well-known refinery for additional power. Cable is Anaconda's 4/0 Awg Duralox Interlocked-armor Cable.

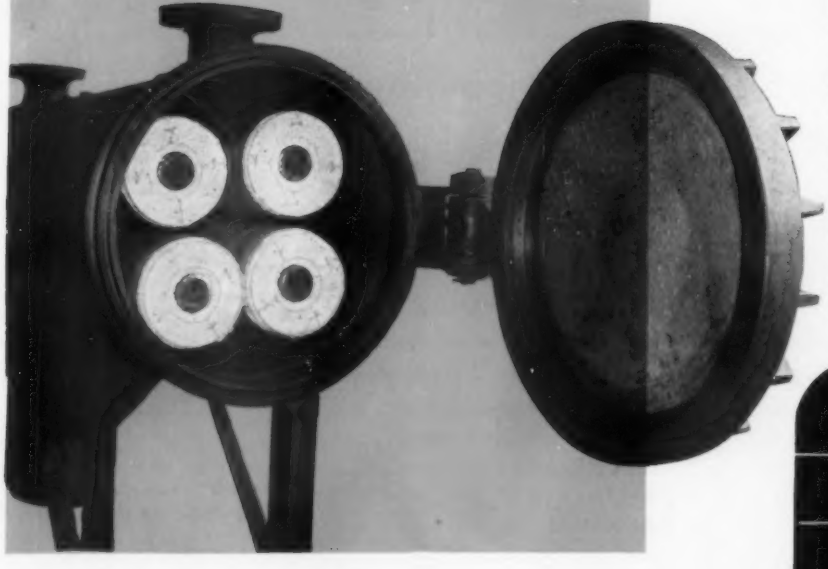
DURALOX CABLE is available in sizes No. 6 Awg to 750 Mcm—copper or aluminum conductors with rubber, plastic, or varnished-cloth insulation—up to 15kv. Underwriters' approved for 600 volts and 5000 volts, varnished-cloth insulation, galvanized steel armor!

EXCEL-SO

HP-700
CLUSTER
REPACK
SEPARATOR
STRAINER



. . . the only high volume pipeline strainer that removes free water from petroleum products!



The HP-700 is rated from 750 to 1000 GPM on gasoline and fuel oil. The four repack cartridges provide a total filtering area of approximately 5,500 square inches. This Separator-Filter effectively removes solid particles down to forty microns in size. Equipped with quick opening closures and other easy service features, this compact unit is designed especially for the pipeline industry. Write for detailed information.

WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

DIVISION OF **FRAM** CORPORATION

Did You Ever See a Double Headed Pump?

This unusual installation is operated by Low-Cost Utility Electric Power

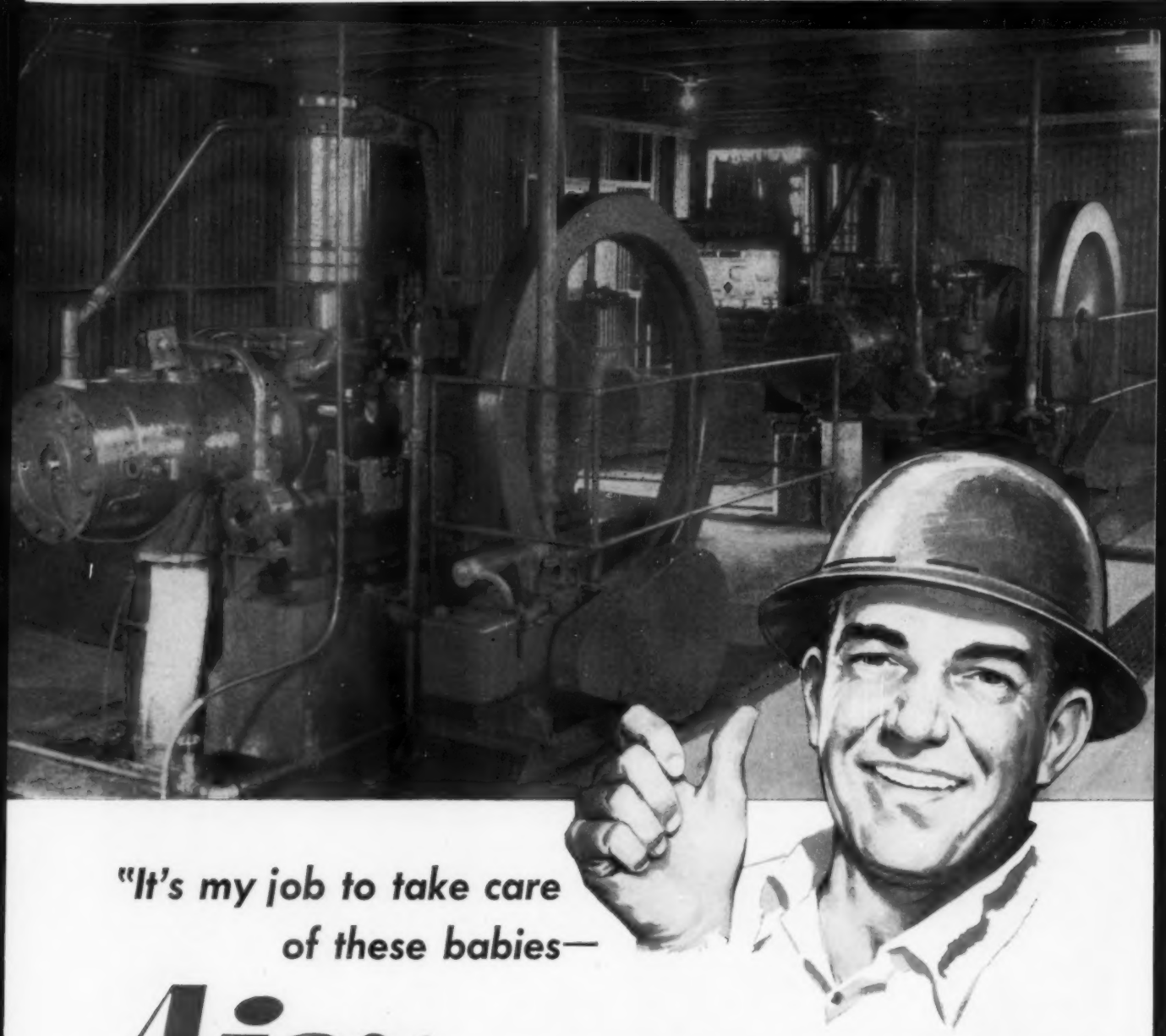
Pumping from different depths but through the same casing, these pumps can be operated simultaneously or singly. Each is operated by AUTOMATICALLY CONTROLLED push-button power – ELECTRIC POWER.

While such installations are not common, it is standard procedure in most fields today to utilize Utility Electric Power because of the overall LOWER COST, greater efficiency, and numerous special benefits.

For helpful counsel on how you can benefit, call the Power Engineer of your Utility Electric Service Company.

I'm LCP – Low-Cost Power
ON THE JOB – 24 HOURS DAILY.

PETROLEUM ELECTRIC POWER ASSOCIATION
P. O. BOX 2771 DALLAS, TEXAS



"It's my job to take care of these babies—

—Ajax SURE MAKES IT EASY FOR ME!"

We build Ajax Gas Engines and Pressure Pumps so that they need almost no attention. *Feed 'em and smile at 'em*, we like to say—*they'll do the rest.*

• Fact is, of course, all fine equipment calls for a good man to care for it. Our point is that AJAX products ask for the minimum of service, over the longest working periods, and are the easiest to handle in any man's experience.

Ask your Supply Man!

AJAX

- **GAS ENGINES**
- **PRESSURE PUMPS**

AJAX IRON WORKS

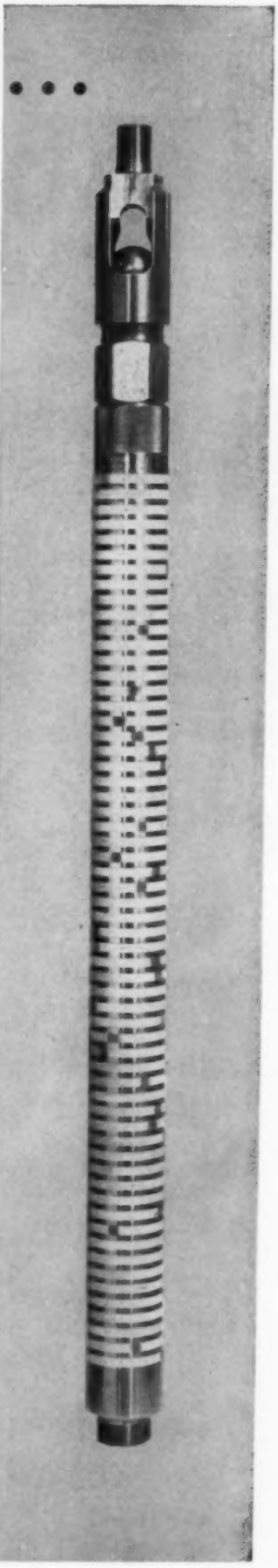
Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

Metal to Metal Wear...

is the real villain in sucker rod pump troubles. It accounts for most of your repair and pump pulling expense.



The Martin Idea...

for getting away from this trouble has always been to make use of the best available materials — *Natural Rubber* for the key material in plunger rings; *Synthetic Rubber* for the key material in resilient ball guides for cages.

The accurately grooved and drilled metal body of **The Martin Plunger** does not touch the barrel. Only the resilient rubber and duck rings contact the barrel. This material — with its great natural resistance to abrasion as well as its slipperyness-when-wet — has a much slower wearing action on the barrel. Most often your barrel will not need replacing. These rings have an amazing ability to take the kind of abuse that goes with oil well pumping, and this means longer runs. Plunger cost is reduced because replacing the rings costs only about one fourth as much as a new plunger, and this saving is, of course, added to the barrel saving and longer runs.

Patent No. 2,591,174

The Martin Rubber Guide Cage protects the ball from all metal contact except when it rests upon its seat. The ball is protected to such an extent that ball and seat life is usually doubled. The synthetic ball guide and stop cannot beat out because of its resilience. Its life is therefore much greater than any metal and you get this longer cage life in addition to better ball and seat life. The two guides are easily replaced when the occasion does arise.

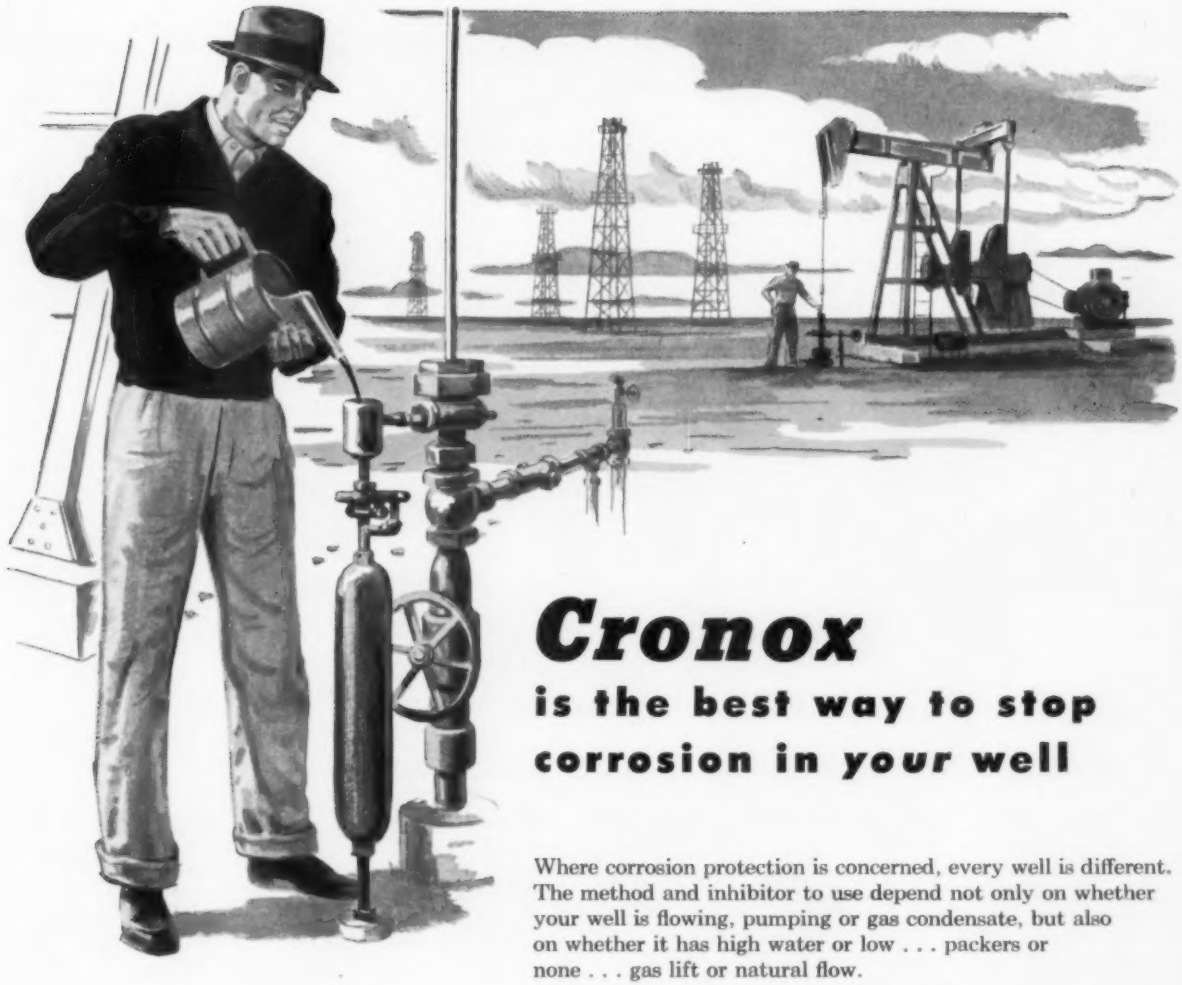
No real capital outlay is required to get these benefits because the cost of Martin Plungers and Martin Cages is very much the same as you are now spending for replacements — sometimes less.

All regular or stroke-thru ROD PUMPS and TUBING PUMPS can be equipped with Martin Plungers. Martin Rubber Guide Cages are made in all sizes and styles. Write for our catalog No. 4; also see Composite catalog for 1956-57.

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.



Cronox

is the best way to stop corrosion in *your* well

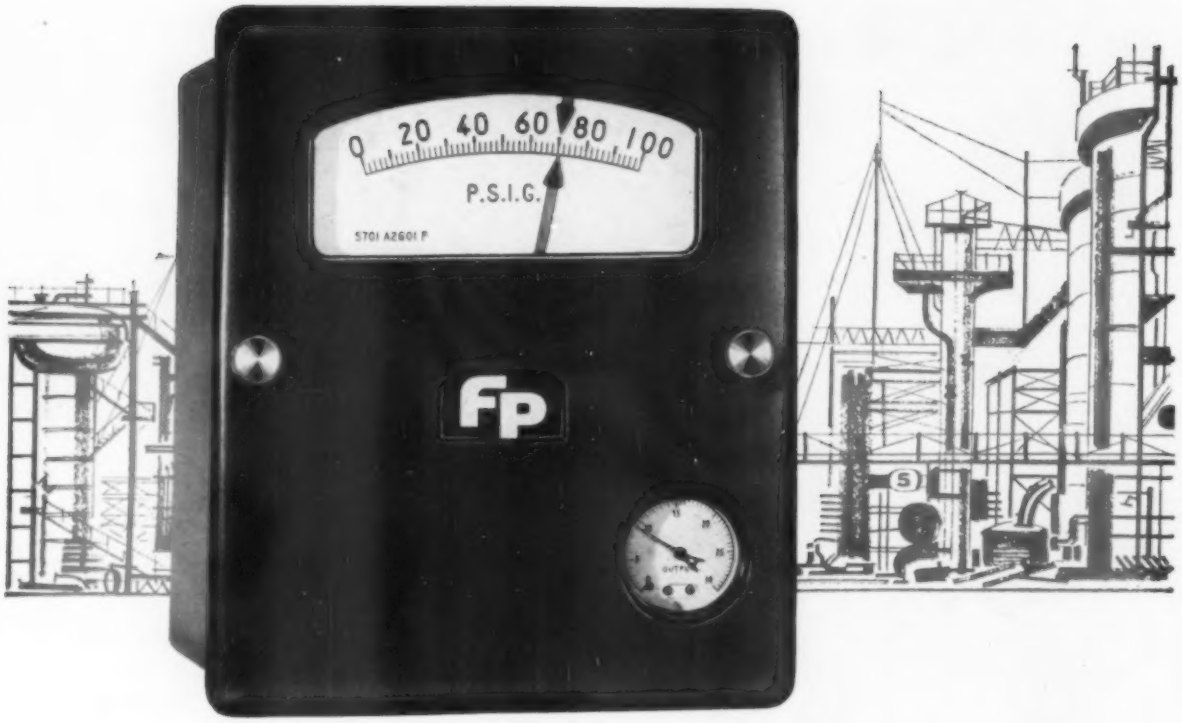
Where corrosion protection is concerned, every well is different. The method and inhibitor to use depend not only on whether your well is flowing, pumping or gas condensate, but also on whether it has high water or low . . . packers or none . . . gas lift or natural flow.

There is a wide range of CRONOX inhibitors to apply to your well . . . including water and oil soluble types . . . vapor phase, stick and concentrated inhibitors . . . bactericides and combination bactericide-inhibitors. And Aquaness field men are thoroughly experienced in ways to use these inhibitors to tackle every type of corrosion situation.

Pennies for protection, using CRONOX inhibitors, can save you thousands in sucker rod and tubing replacement and lost production. Get your engineered corrosion control program started now, by calling your local Aquaness representative.

Write for a copy of the new booklet, "CRONOX Corrosion Inhibitors"

Aquaness
Department
ATLAS
ATLAS POWDER COMPANY
2005 Quitman Street, Houston 26, Texas



new small instruments in fiber glass cases
indicate . . . transmit . . . control temperature or pressure

NOW . . . instruments as corrosion-resistant as the equipment they control! Every instrument in Fischer & Porter's new 1450 Series is housed in a fiber glass reinforced polyester case resistant to acids, alkalis, salts, solvents, dust, and weather. You can place indicators, transmitters, and controllers wherever you want—inside or out—without regard for corrosive fume and splash. The protection is built right into the housing . . . nothing to wear away or scratch off . . . no coatings to renew. The first such equipment available for process instrumentation, Series 1450 brings a new flexibility and freedom to instrument installation.

There's no way for corrosive atmospheres to reach the working instrument. Every exposed part is either plastic or 316 stainless steel. And a polyvinyl chloride gasket provides a positive seal against dust and moisture entry.

F&P has engineered the unique new 1450 Series housing for operation and maintenance ease. The entire instrument can be removed from the case if desired. Zero adjustment and range changes are easy. A plug in the removable door provides access to the adjustment screw for the optional external set point.

Field tested over a one year period, the 1450 Series is available NOW on four week delivery schedules.

SERIES 1450

CORROSION-PROOF INSTRUMENTS

Temperature Range:

minus 400F to plus 1000F.

Pressure Range:

30" Hg vacuum to 5000 psi
As pneumatic receivers, 1450 instruments accommodate 3 to 15, 3 to 18, or 3 to 27 psi signals.

Instrument Options:

Single indicator • dual indicators • single indicator with dual alarms • indicating controller with any mode of control • indicating transmitter. Transmitter can provide pneumatic outputs, resistance outputs, or differential transformer outputs.

Controller Options:

- universal controller with on-off, proportional, differential gap, and manual reset
- wide band proportional
- wide band proportional plus automatic reset
- wide band proportional plus automatic reset plus derivative

Mounting:

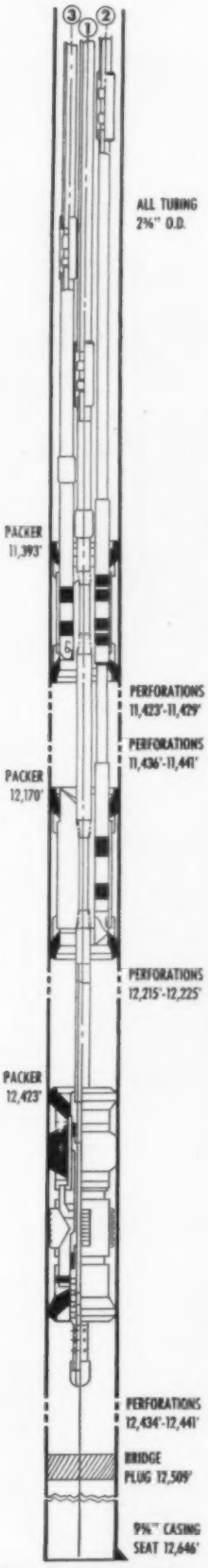
Suitable for surface, pipe, or panel mounting. Panel cutout size is 8¼" x 10¼".

For complete data write Fischer & Porter Co., 3187 County Line Road, Hatboro, Penna.

FISCHER & PORTER CO.

Complete Process Instrumentation

America's "first" triple-completion well depends on NATIONAL SEAMLESS STEEL TUBING



Schematic of Triple Completion

•About five miles northeast of St. Martinsville, Louisiana, stands the country's most unique Christmas tree—that of *America's first* high-pressure, triple-completion well. This single Christmas tree tops off three strings of tubing to permit simultaneous, but separate, production from three different zones.

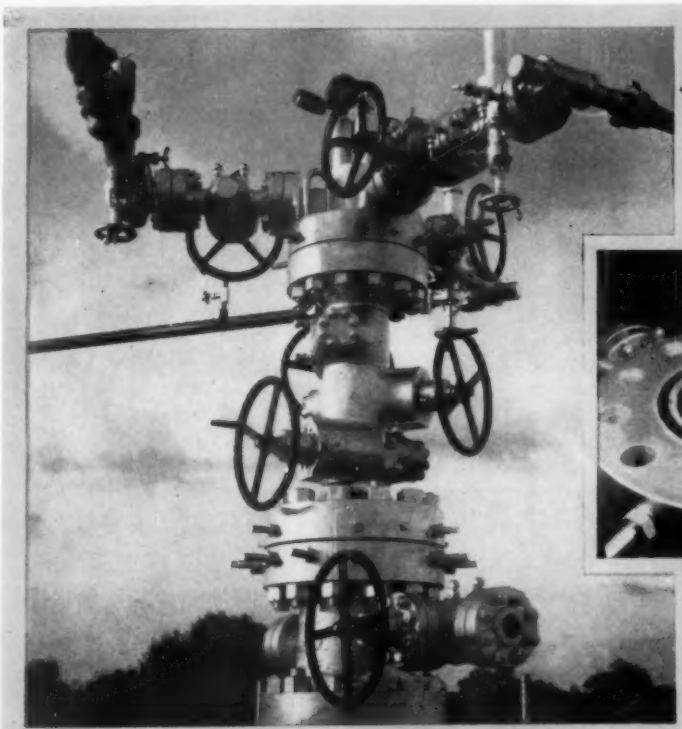
Owned by Aluminum Company of America, Mining Division, the triple well serves the same purpose as three singles, at a fraction of the cost.

The well is bottomed at 12,646 feet, where 9⅝-in. National Seamless Casing was set. Oil, rated at between 40 b/d and 60 b/d of 35.4 gravity, is produced from two perforation intervals in the top zone—11,423-29 ft. and 11,436-41 ft. Gas is produced from the second and bottom zones—12,215-25 ft. and 12,434-41 ft., respectively.

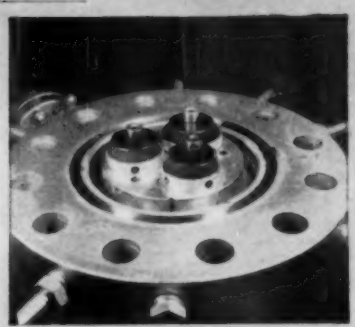
Approximately 35,949 feet of 2⅜-in. National Seamless Tubing were used in the three strings. The top zone tubing pressure was 3150 lbs. The three strings were suspended in a triple tubing head spool and triple bore parallel string tree. The setting is designed so that each tubing string can be pulled independently.

National Seamless Oil Country Tubular Products are habitually chosen when the job has to be done "just right." No matter how rigorous the conditions, National Seamless products promise trouble-free dependability. The seamless process of manufacture gives them unsurpassed uniformity and strength, the best defense against high pressures, vibration, fatigue, twisting action, and collapse.

For more complete information, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



Three flow lines off Christmas tree permit separate production of gas and oil from three different zones.



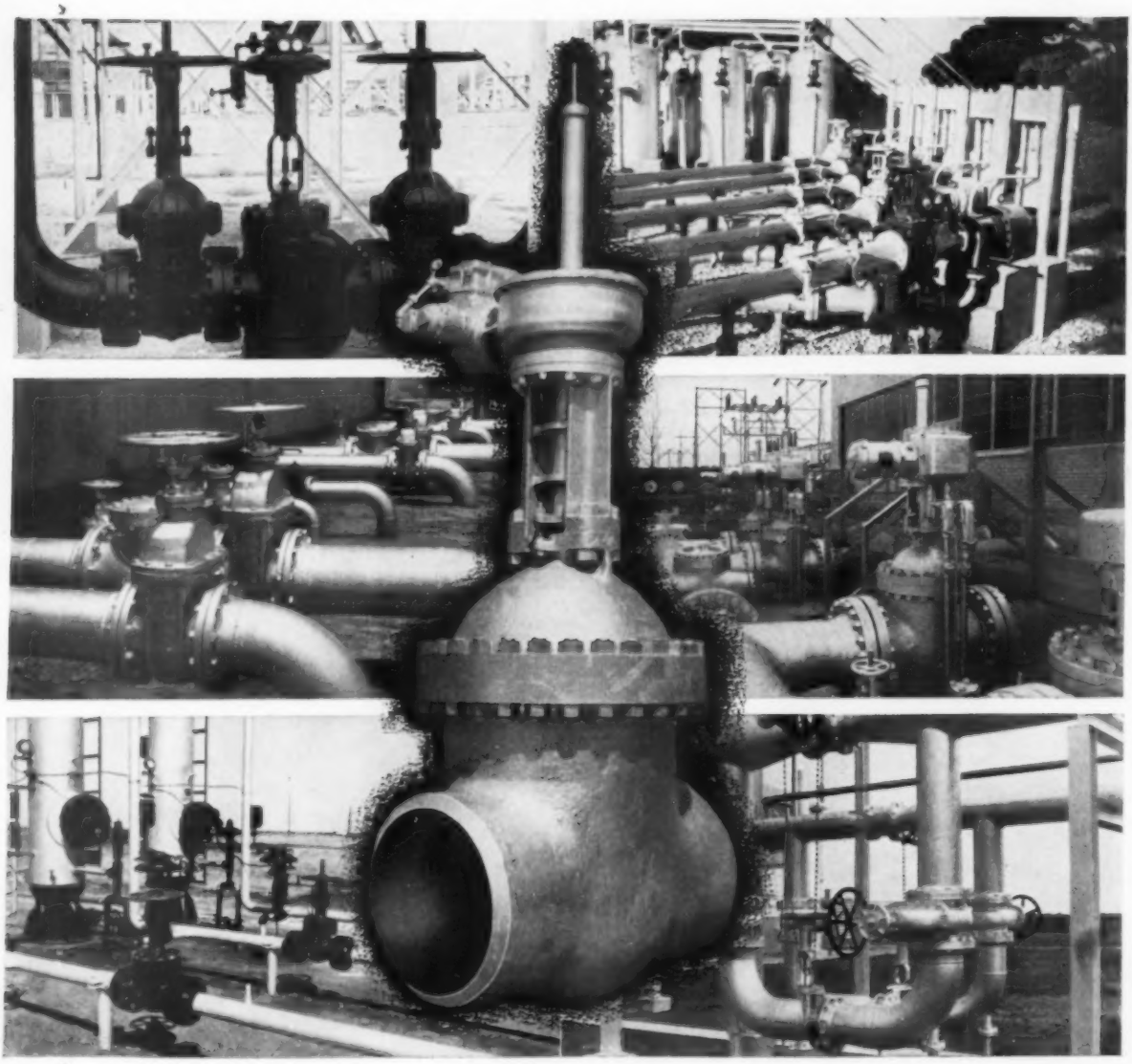
Three strings of tubing show at top of head spool.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL USS **SEAMLESS**

DRILL PIPE . . . CASING . . . TUBING

UNITED STATES STEEL



Unmatched advantages whatever the service . . . with

Darling Fully Revolving Double Disc Parallel Seat Gate Valves

ALL the Darling gate valves shown here, from the large 30" main line valve to small 4" loading pump valves share identical multiple advantages. They operate with the positive yet easy closure . . . the uniform wear distribution . . . the elimination of disc-to-seat galling . . . the adjustment for valve body distortion . . . the minimum, simplified maintenance and the extended, trouble-free service life made possible by the well-proved fully revolving double disc gate principle perfected by Darling.

Why not check into Darling gate valves for your next requirements? Find out *how* they assure all these advantages . . . and let us give you proof! Write for Catalog No. 57.

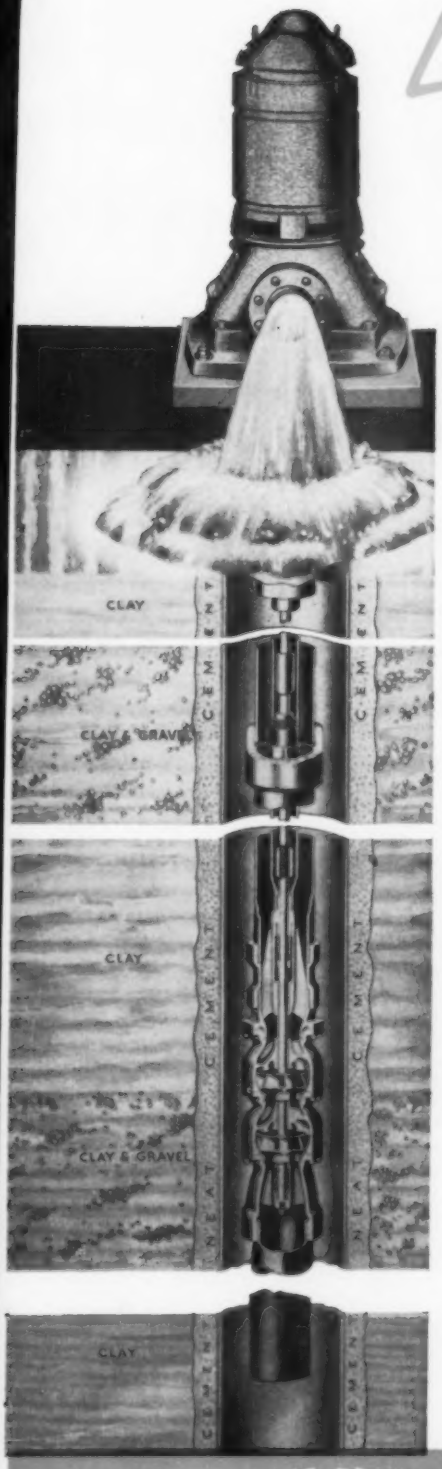
DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

DARLING VALVES

Layne knows more about water bearing formations!



On whose say-so? Not on ours—but on the experience of scores of American and foreign firms and municipalities whose very existence and success depend on an adequate supply of water.

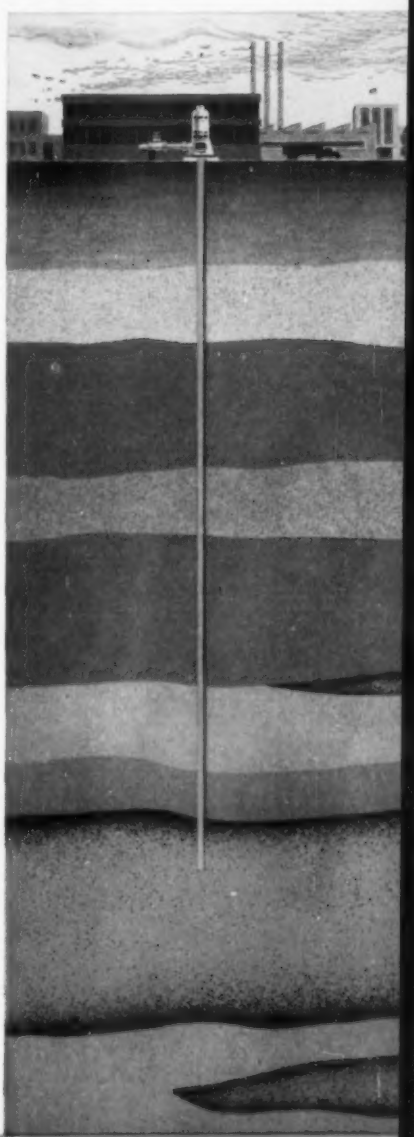
Knowing where the water is — and then tapping the subterranean source is but a part of the vast knowledge the Layne organizations have accumulated in three quarters of a century.

Once the source is determined and the water supply developed, a dependable means for delivering the water must be provided, and that's where the famous Layne pump comes in. For each Layne pump is specifically engineered for the particular job. There is no "stock" Layne pump. Your pump is created for your job —making use of the knowledge of strata, water requirements and usage.

ENGINEERED, DEPENDABLE PERFORMANCE IS WHAT YOU GET WHEN LAYNE DOES THE JOB — COMPLETE FROM WATER LOCATION TO YEAR AFTER YEAR OF TROUBLE-FREE PUMPING.

YOUR NEXT WELL AND PUMP INSTALLATION MAY BE MONTHS OFF. GET TO KNOW THE LAYNE FOLKS IN YOUR AREA. SAVE TIME AND MONEY THROUGH THEIR INTIMATE KNOWLEDGE OF WATER.

Send now for our general services bulletin No. 100.



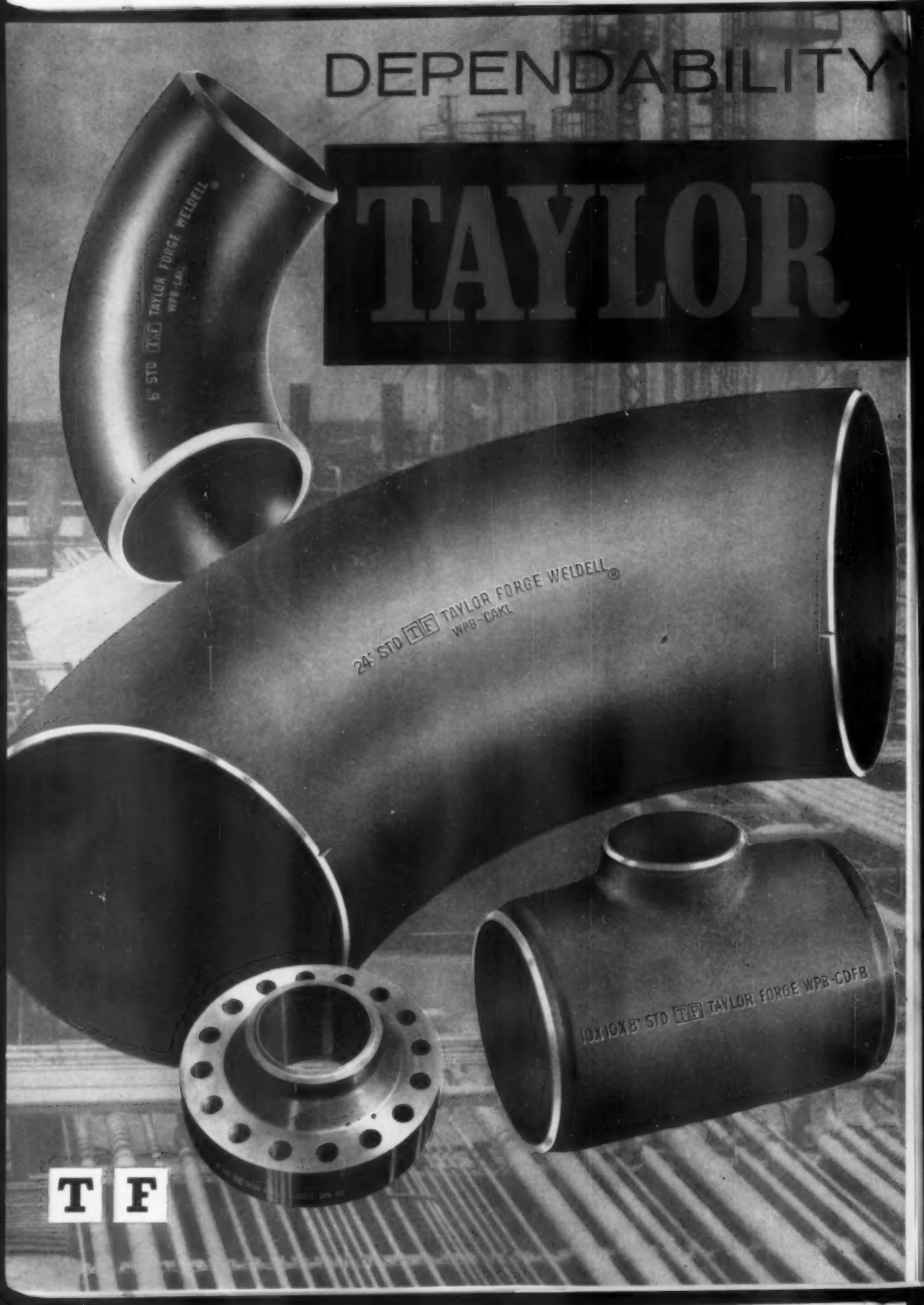
WATER WELLS • VERTICAL TURBINE PUMPS • WATER TREATMENT

1882 — 1957
Layne
75 YEARS OF PROGRESS

LAYNE & BOWLER, INC. MEMPHIS

General Offices and Factory • Memphis 8, Tennessee

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD


DEPENDABILITY
TAYLOR
6" STD TF TAYLOR FORGE WELDELL
WPB-CAKL
24" STD TF TAYLOR FORGE WELDELL
WPB-CAKL
10X10X8" STD TF TAYLOR FORGE WPB-CDFB
TF

. . QUALITY. . . SERVICE

FORGE Welding Fittings and Forged Flanges

The quality of these Taylor Forge products is unquestioned . . . backed by 56 years of continuous research, testing and experience. Their dependability has been demonstrated in every conceivable type of application and under the most punishing conditions. Service is unexcelled because the Taylor Forge line is the complete line embracing every size and type, every thickness or weight, every material that can be worked by any forging process.

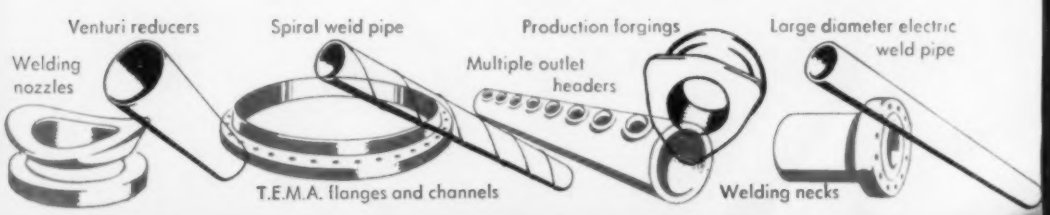
Yes, with Taylor Forge, Quality is a creed . . . Dependability a long established truth on which an unassailable reputation has been built . . . and Service an accepted responsibility. Taken together, they provide three excellent reasons why, for Welding Fittings and Forged Flanges it pays to "turn to Taylor Forge".

. . . TRADITIONALLY DEPENDABLE

Taylor Forge & Pipe Works

General Offices and Works: P. O. Box 485, Chicago 90, Illinois
Plants at: Carnegie, Pa., Gary, Ind., Houston, Texas, Fontana, Calif., Hamilton, Ont., Canada
District Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Atlanta, Chicago, Houston, Tulsa, Los Angeles, San Francisco, Seattle, Toronto, Calgary, Montreal.

To take full advantage of both product excellence and fine service, patronize your local Taylor Forge Distributor.



ACCO
for Better
Values

THE COMPLETE LINE—

R-P&C VALVES

DESIGNED FOR DEPENDABILITY

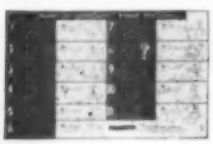
R-P&C FORGED STEEL GATE VALVES ARE NOW IMPROVED TO GIVE EVEN BETTER SERVICE

R-P&C Forged Steel Gate Valves, developed specially for the power, petro-chemical and process industries, are now better than ever. These dependable valves have been improved for greater safety, better performance and longer service life.

Illustrated above is a general purpose valve of the 800 Series; it is rated at 2500 PSI at 100° F., or 800 PSI at 850° F., and is furnished in eight sizes from ¼″ to 2″. It is available with either screw (F-56) end or socket weld (F-57) end, and with conventional and full port openings. Also available in flanged ends with conventional port openings in 150, 300 and 600 lb. with A.S.A. standard flanges and A.S.A. standard face to face. For details, write for Booklet DH-80.

The R-P&C Line is Complete

Whatever your valve requirements may be, *look first to your R-P&C Distributor.* The R-P&C Valve line includes gate, globe, angle and check valves in all standard valve materials—bronze, electric iron and cast steel, as well as the forged steel line described above. An exceptionally wide range of styles, sizes and pressure classes is available. In addition, R-P&C offers a full line of cast steel fittings, also specialties such as asbestos-packed cocks, bar stock valves, Lubrotite gate valves and other items. Order through your R-P&C Distributor. For complete R-P&C catalog, write our Reading office.



FREE WALL CHART
"How to Protect Your Valves"
Installation pointers, operating tips, clues to longer valve life. They are all on this 22″ x 17″ wall chart. Write for your free copy.

R-P&C VALVE DIVISION
AMERICAN CHAIN & CABLE

Reading, Pa., Atlanta, Boston, Chicago, Denver, Detroit, Houston, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

Field Proven in a 4 YEAR TEST!

Four years of dependable, low-cost operation from this efficient Wheland HP-14000 Pump shown on location in North Texas. Owner, Mr. R. C. Turner of Turner & West, is shown at left, standing beside Wheland representative, Mr. A. B. Drake.

TURNER & WEST
BOX 1160
GRAHAM, TEXAS

April 24, 1957

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

We purchased one of your HP-14000 pumps about four years ago. This pump has done a tremendous amount of work during this time, with a minimum of expense. We believe your pump is thoroughly field proven.

We operate this rig in North Texas area, drilling interest deals and for our own accounts, from 3000 to 5000 feet.

Yours very truly,

TURNER & WEST

R. C. Turner

WHELAND HP-14000 DUPLEX SLUSH PUMP

"...has done a tremendous amount of work...with a minimum of expense...thoroughly field proven."
—Mr. R. C. Turner

HP-14000 — 7½" x 14", 350 HP Nominal Input at 60 RPM. Discharge Pressure with 7½" liner 838 PSI, with 5½" liner 1627 PSI.

From the Complete Line of Efficient Wheland Slush Pumps.
WRITE FOR DESCRIPTIVE BULLETINS.

TROUBLE-FREE OPERATION • LOWER MAINTENANCE
DELIVERS MORE PRESSURE PER POUND OF PUMP!

WHELAND
ROTARY DRILLING MACHINERY

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.
DRAW WORKS • SLUSH PUMPS • ROTARIES
CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas • JONES AND LAUGHLIN STEEL CORPORATION, SUPPLY DIVISION—Main Office: Drawer 2481, Tulsa 2, Oklahoma.

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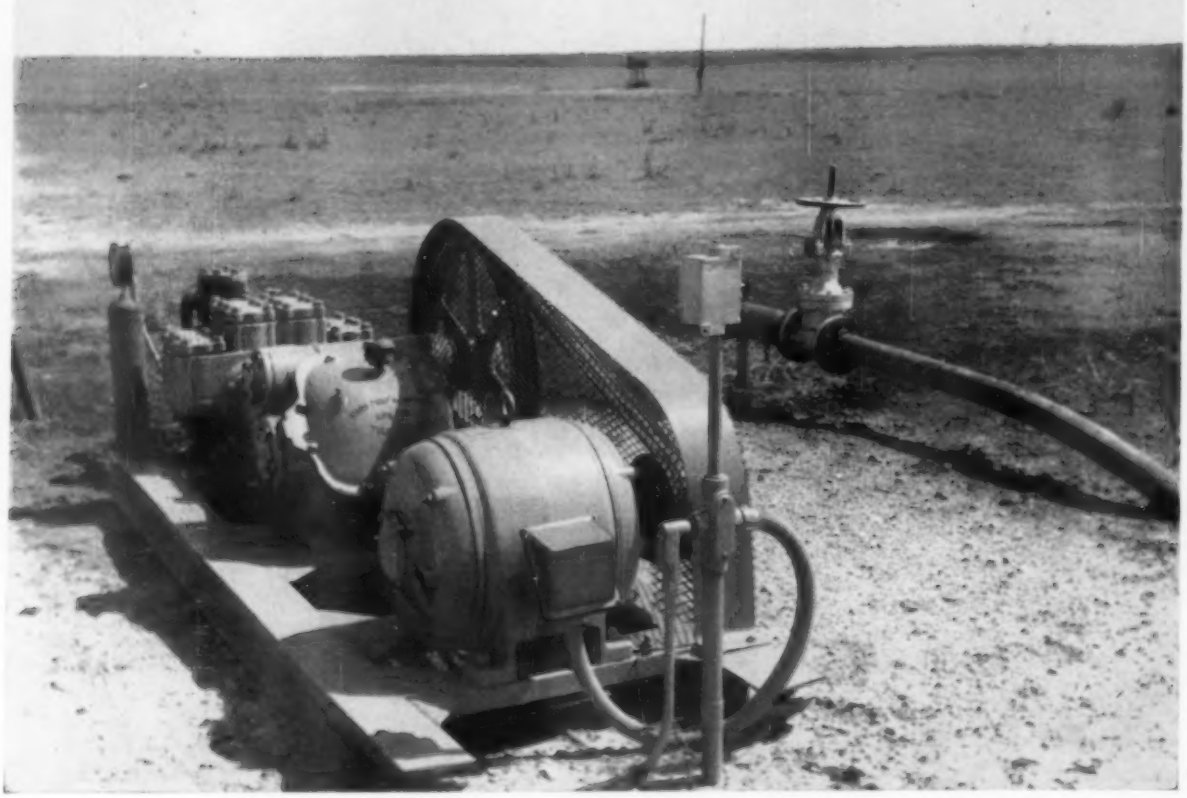
WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



for uninterrupted gathering... power your pumps with Wagner Motors

A motor that drives a pipe line gathering pump has a downright lonesome job. Nothing for company but an occasional horned toad or rattlesnake. Even the visits of the maintenance crew are few and far between—especially if it's a Wagner Motor.

Wagner Type DP cast-iron frame oil well pumping motors are especially designed for year around, maintenance-free, rugged outdoor service. They are protected against rain, sand, snow, by an enclosure that is completely drip-proof—virtually splash-proof. They are protected against horned toads and rattlesnakes by screened ventilating openings. They are protected against acids, alkalies and corrosive elements by their cast iron frames and endplates. Conduit boxes are moisture-proof and dust tight.

For locations where only single-phase current is available, Wagner has high power factor type capacitor-start motors with the same protection. You can get Wagner oil well pumping motors *from stock* in your immediate area.

Wagner also supplies the petroleum industry with Type JP explosion-proof motors in ratings through 250 hp. Bulletins MU-132 and MU-137 give full information. Write for your file copies.

TIME-TESTED FAVORITES OF THE PETROLEUM INDUSTRY

TYPE DP

TYPE JP

In the field... *In the refinery!*

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

M37-15

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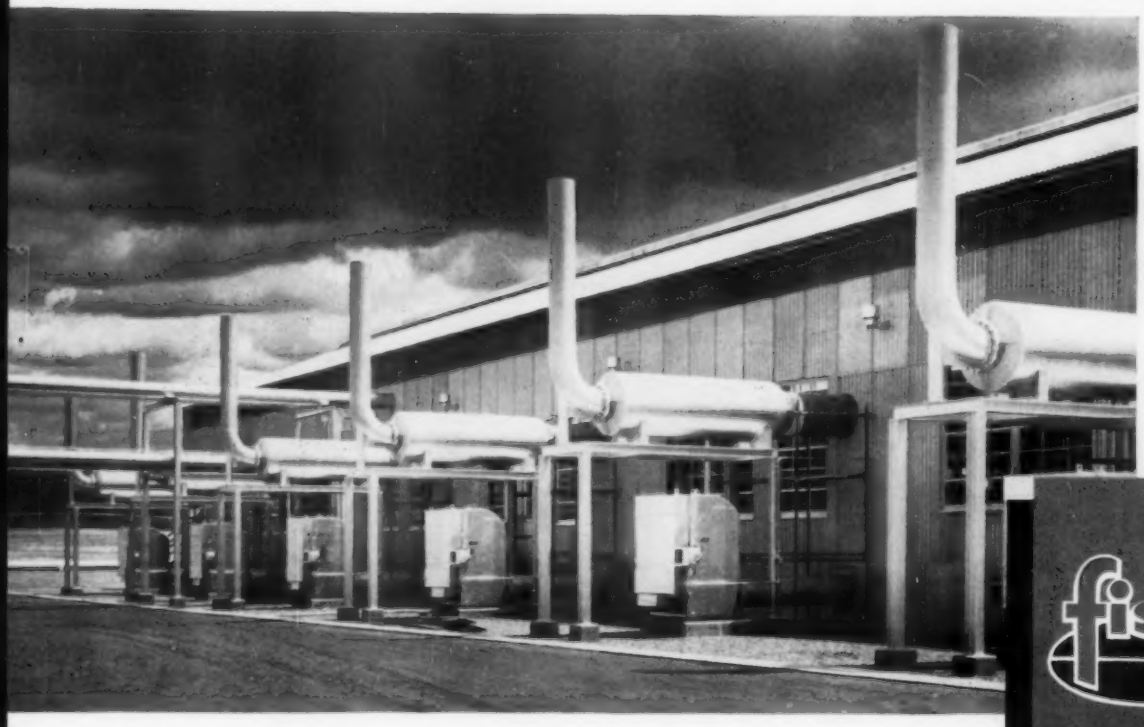
Wagner Electric Corporation
6389 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

why this key compressor station works dependably despite these

temperature extremes



Compressor Station One is the key supply installation on the sprawling Pacific Northwest Pipeline system. Located at 6000 feet elevation near Ignacio, Colorado, the facilities boost pressure of nearly 300-million cubic feet of gas per day from the San Juan Basin gathering system. This station feeds a nearby gasoline plant before starting the gas on the long haul to the Pacific Northwest market.

In such a key spot, dependability is essential. Fish engineers carefully reviewed possible causes of trouble long before thoughts went into plans.

Extreme temperature fluctuations—from plus 100 degrees F. to minus 20 degrees F.—posed unusual problems. Under these conditions, reliable temperature control was difficult to achieve.

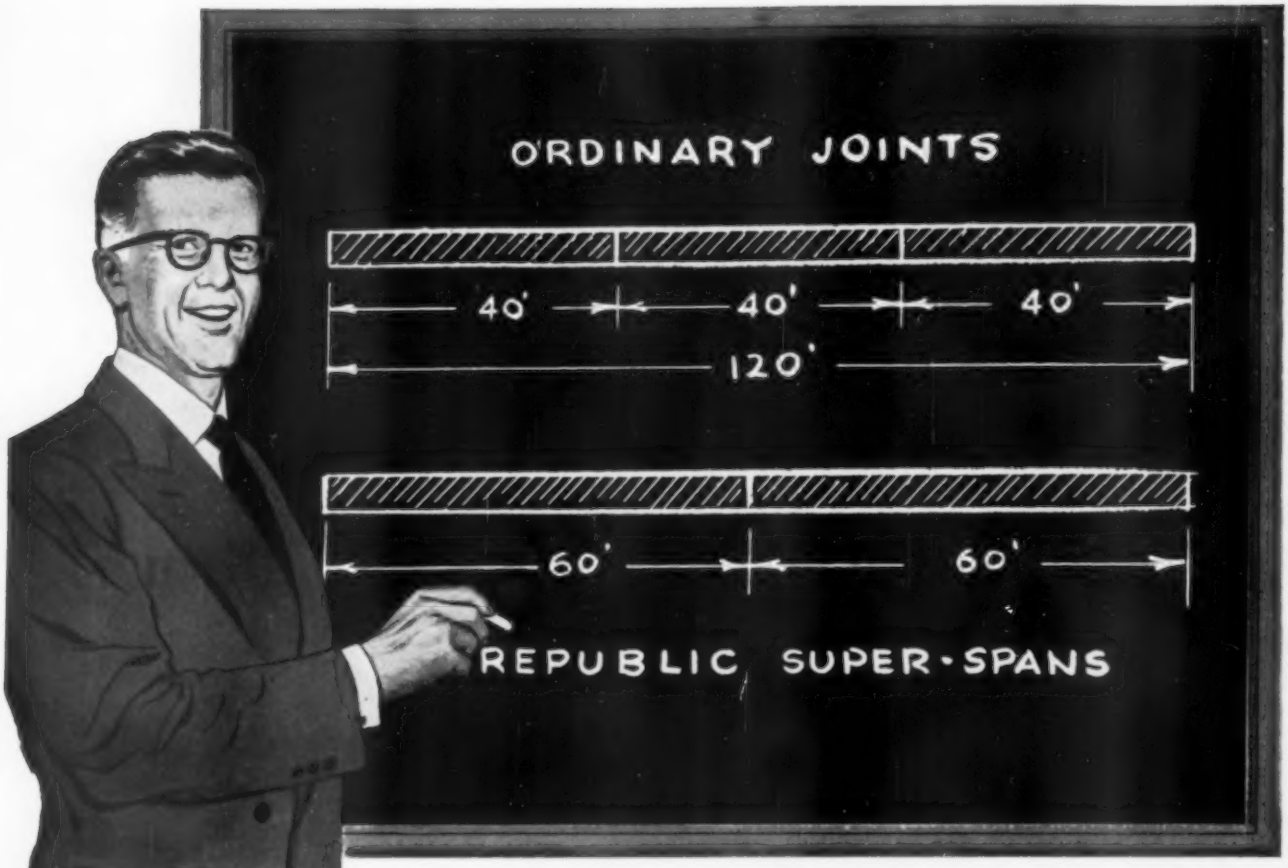
To be sure of providing efficient jacket water and lube oil temperatures under all extremes of ambient temperature and load, Fish designers elected to use unitized systems. Under this system, each engine has its own atmospheric cooler to take care of jacket water and lube oil cooling loads. A system of temperature control instruments was installed to provide very close control under all operating conditions. As designed, this remote station demonstrates extreme flexibility with reliability.

This is but one example of the type of advanced engineering you get from Fish. In addition, the same quality service prevails from feasibility study to project completion. If you are contemplating new or expanded facilities in oil, gas or chemicals, consult with Fish.

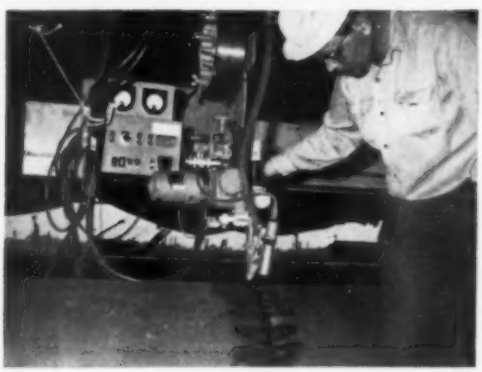
the fish companies

Houston

FISH ENGINEERING CORPORATION
FISH NORTHWEST CONSTRUCTORS, INC.
FISH SERVICE CORPORATION



HIGH-QUALITY FACTORY WELD joins two 30-foot lengths of Republic Fusion Weld Line Pipe to produce 60-foot "SUPER-SPAN" joint. Here, perfect line-up is assured by rubber-tired support rollers as stringer bead is applied.



"SUPER-SPAN" JOINT IS COMPLETED in two passes by this fully automatic submerged-arc welding machine. Weld is as sound as longitudinal weld. Resulting length is 50% longer than ordinary 40-foot joint. Send coupon for complete data.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

ELIMINATE *1 out of 3* FIELD WELDS

With Republic Fusion Weld Line Pipe "SUPER-SPAN" Joints

By direct comparison, two Republic "SUPER-SPAN" Joints of fusion weld line pipe cover the same distance as three conventional joints. This means when you install "SUPER-SPAN" you can eliminate every third field weld!

Savings in field construction time are obvious. One-third less field welds are required, which means that field welding crews move ahead faster—and lay 50% more footage with the same manpower.

Beyond savings in time and money, Republic's exclusive "SUPER-SPAN" Fusion Weld Line Pipe Joints provide end-to-end uniformity to assure interruption-free laying. Over the years, Republic's 30-foot joints have built an enviable reputation for consistent diameter and wall thickness. Laying crews can line up joints fast and accurately—complete field welds with maximum speed, unhampered by costly burn-throughs due to thin spots. Further, uniform high ductility and yield strength of Republic Fusion Weld facilitates field bending and provides unexcelled dependability in high-pressure service.

Now, "SUPER-SPAN" combines all of these advantages plus the economy of 60-foot joints. The manufacturing process employs the latest approved welding technique. Two 30-foot lengths are joined under controlled conditions by automatic submerged-arc welding equipment. Completed girth weld is as reliable as the longitudinal weld itself.

Republic is a leading producer of pipe for every oil and gas handling application. For full information, contact your local Republic office or mail coupon.

ELIMINATE CORROSION PROBLEMS in a wide variety of oil and gas handling applications with Republic Plastic Pipe. Republic produces a complete range of sizes in SRK (Semi-Rigid Kralastic), SRB (Semi-Rigid Butyrate) and FE (Flexible Polyethylene). Plastic piping is light and easy to use. Send for facts.

ELIMINATE FASTENING PROBLEMS on assembled equipment and components by specifying Republic Bolts and Nuts. Produced under full control from raw ore to finished product, Republic fasteners provide quality beyond minimum industry standards. Over, 20,000 standard and 8000 special types and sizes are available to meet your requirements.

ELIMINATE DELAY AND CONFUSION in pipeline-system control and communication by installing a microwave radio system. Republic's Truscon Steel Division can furnish the exact antenna tower you need, guyed or self supporting, to provide maximum on-the-air continuity under all weather conditions. Mail coupon for illustrated literature.

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for
longer
valve life

in a variety of
corrosive services

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GATE VALVES

Where you encounter acids, salt and alkaline solutions, sea water, brine or other corrosive fluids, vapors or gases, you'll want Jenkins Ni-Resist Type 2 Cast Iron Gate Valves with type 316 stainless steel trim. They have a remarkable ability to withstand destructive corrosion and erosion.

In paper mill service, food processing, petroleum refining, chemical plants and other process industries, Jenkins combination of Ni-Resist type 2 cast iron and type 316 stainless steel, plus Jenkins extra *value* construction throughout greatly extends valve life.

Designed especially for corrosive services, the Jenkins Ni-Resist line of gate valves also has superior metal-to-metal wearing qualities. Copper-free, they will not discolor or contaminate products being carried in the line. Let the famous Jenkins Diamond be your guide when choosing Ni-Resist valves . . . it means longer, trouble-free service.

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VALVES
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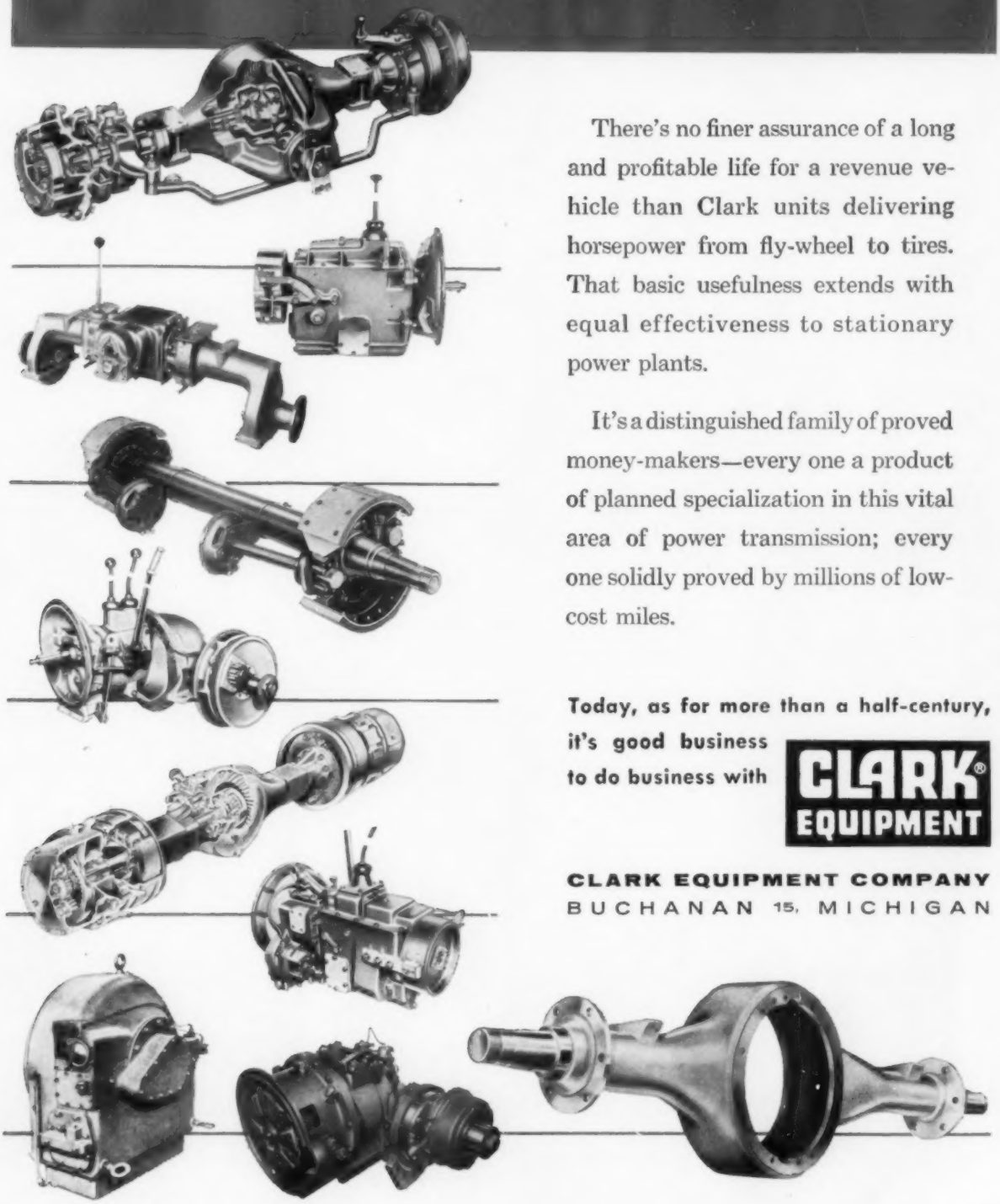
Sold Through Leading Industrial Distributors Everywhere

From fly-wheel to drive-wheel
. . . let it be CLARK



There's no finer assurance of a long and profitable life for a revenue vehicle than Clark units delivering horsepower from fly-wheel to tires. That basic usefulness extends with equal effectiveness to stationary power plants.

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In its business of developing improved refining processes for the oil industry, Universal Oil Products Company has long been vitally concerned with effective means of producing the valuable chemical products from petroleum. The great worth of these petrochemicals to our national economy is recognized by everyone. They are vitally important to the refining industry, too, if refiners are to maximize the value of products from crude oil processed through their plants.

In the interest of the oil refining industry UOP has recently established a program of petrochemical process and marketing development. Under this program any refiner, anywhere in the free world, regardless of the volume of his operation will be able to enjoy the economic and operating advantages which the production of the petrochemicals most suited to this operation can provide.

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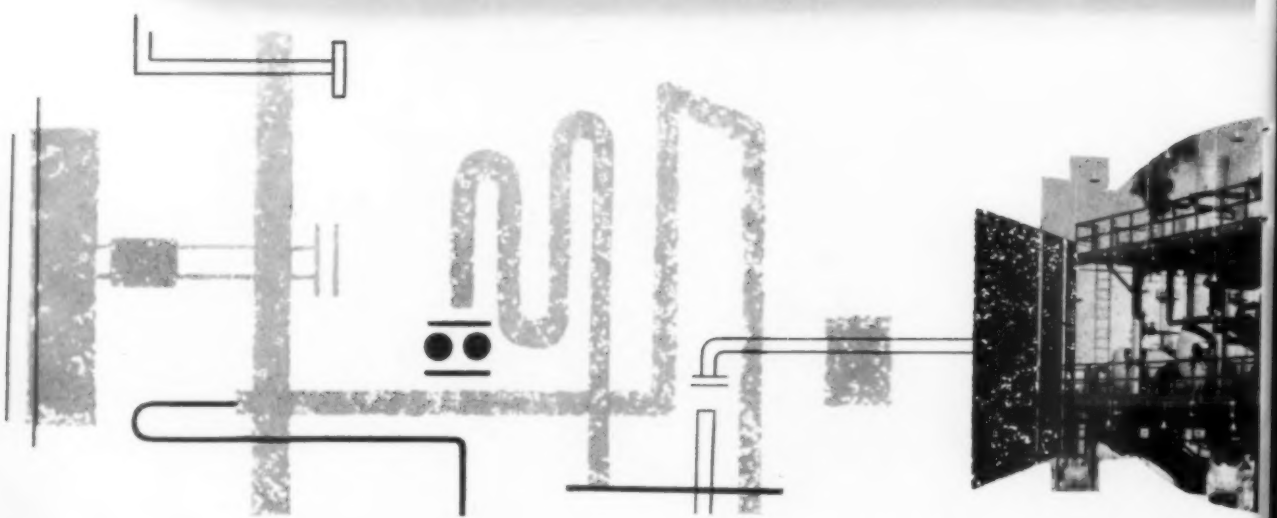
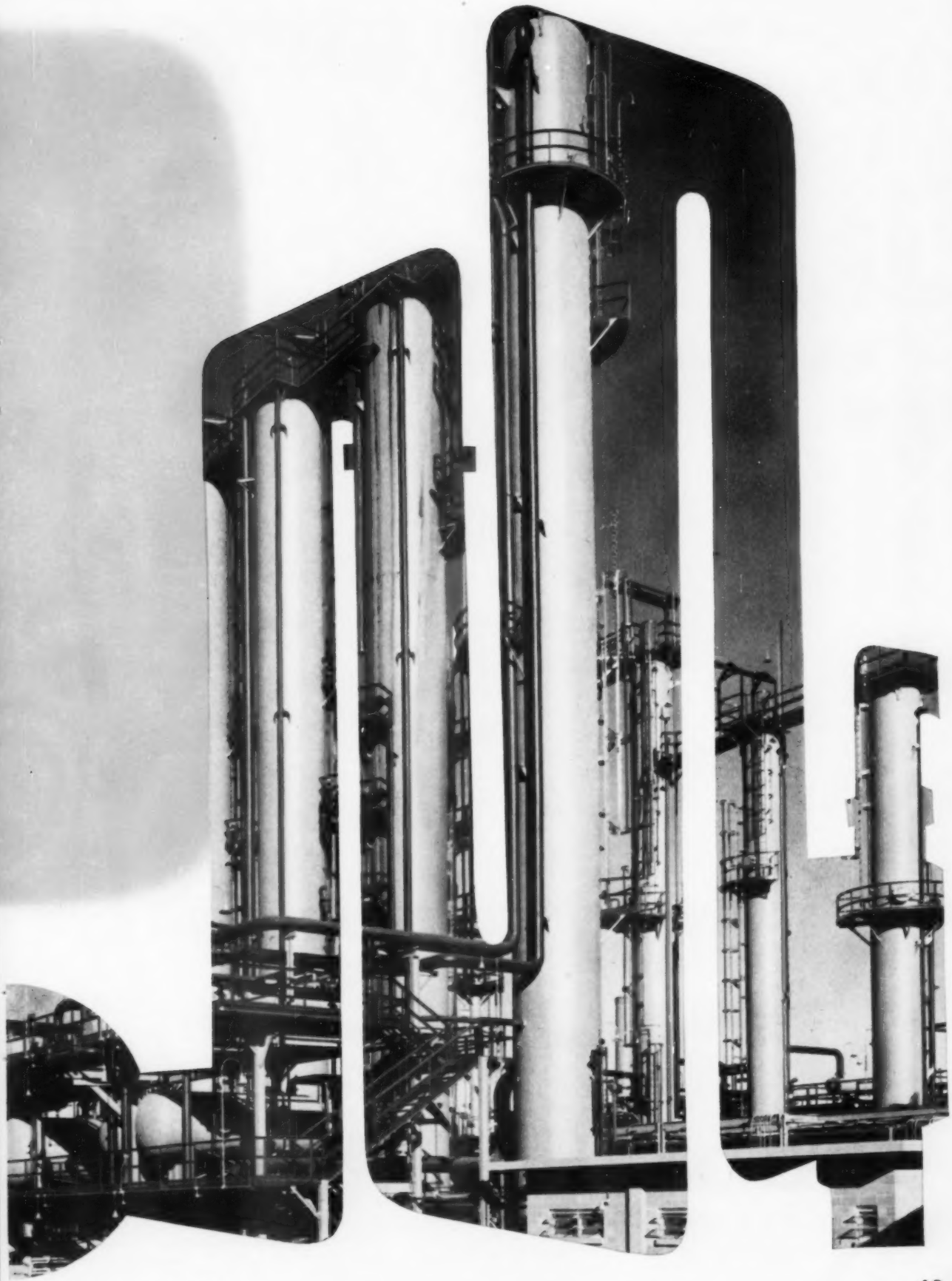




Wherever crude or products move...

—record each barrel with the sustained accuracy and low maintenance of

BRODIE *BiRotor* METERS

- Double case construction isolates measuring element from distortional effects of piping strains and line shocks
- Just 4 simple unit-built assemblies may be inspected, serviced or replaced without disturbing line connections
- Positive displacement accuracy with vibration-free performance of true rotary operation in complete static and dynamic balance
- Only 2 moving parts in measuring element, with no metal to metal contact to cause wear
- Simple dry adjustment while meter is in operation

In hundreds of installations, the continuous high volume runs of pipeline service have proved the higher sustained accuracy and lower maintenance of Brodie *BiRotor* Meters. For crude or product measurement at its best, consider the exclusive advantages of *BiRotor* design and performance. Write today for full details.

PRODUCTS—head of line station

CRUDES—to tank storage

PRODUCTS—dual counter installation

PRODUCTS—pipeline terminal

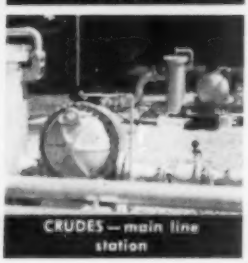
CRUDES—custody transfer

CRUDES—main line pumping station

PRODUCTS—terminal takeoff

CRUDES—to refinery from pipeline

CRUDES—incoming to main line station


CRUDES—main line station

BRODIE BiRotor METERS

ALL-STEEL TRUE ROTARY

RALPH N. BRODIE COMPANY · San Leandro, California, U.S.A.

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✓ happy balance between dependable performance and moderate cost

ROLLWAY STEEL CAGE ROLLER BEARINGS

Tru-Rol *precision, steel-cage, heavy-duty bearing with contoured guide lips assuring true right-line rolling, maintained roller alignment and thin oil film.*

● Rollway's *TRU-ROL* Steel-Cage Bearings afford wide latitude in balancing *dependable* performance, *long* life, and *high load* capacity against *moderate* cost. They rate high in any comparison on a cost-performance basis.

A choice of stamped steel retainers with contoured guide lips, or steel segmented retainers assure true rolling and an evenly distributed *thin* oil film — *big factors in reducing power losses and heating.*

"Crowned" Rollers Relieve End Stress

TRU-ROL offers the extra advantage of a finish-ground "crown" radius on the roller ends. That relieves high end-stress and insures uniform load distribution over the entire length of the roller. The result: *TRU-ROL* Steel Cage Bearings carry heavier loads over longer periods without excessive end-fatigue. They are less affected by slight misalignment or shaft deflection.

Investigate *TRU-ROL* Steel Cage Roller Bearings before selecting any bearing in the medium price range.

TYPE D

Rollway Metric Series Steel Cage Roller Bearings

● Rollway Metric Series Steel-Cage Bearings offer the greater load capacity of solid cylindrical rollers, plus the true right-line rolling of trunnion rollers turning in a rigid steel cage. There's no roller skew, no pinch out, no cam action. Design permits maximum bearing capacity . . . within small space . . . at moderate cost.

Let Rollway Help...

Our complete engineering and metallurgical services will gladly work with you on your problem. Simply write or wire any sales office. No cost. No obligation.

Rollway Bearing replacements are available through authorized distributors in principal cities. Consult your classified phone directory.

ROLLWAY BEARINGS

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

ROLLWAY BEARING CO., INC. SYRACUSE, N.Y.

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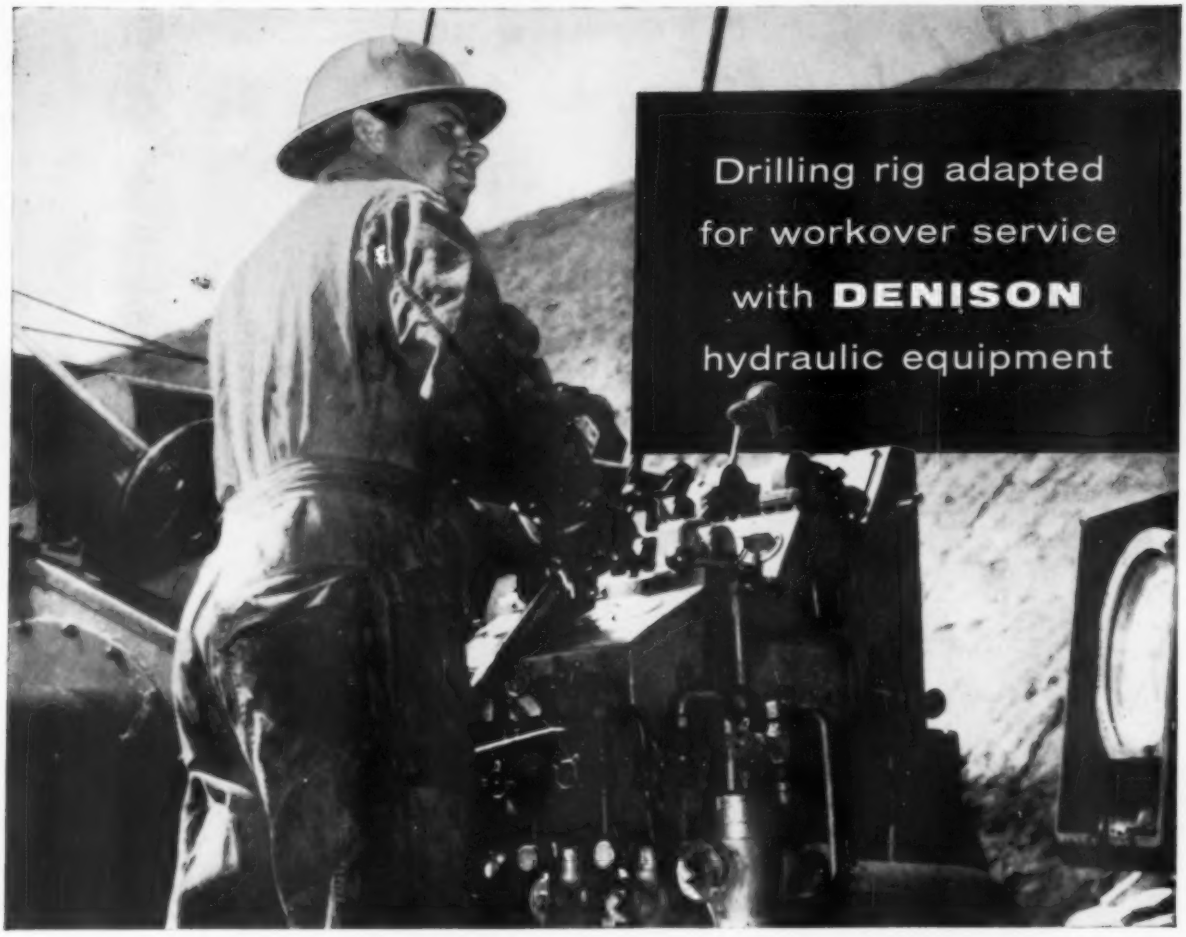
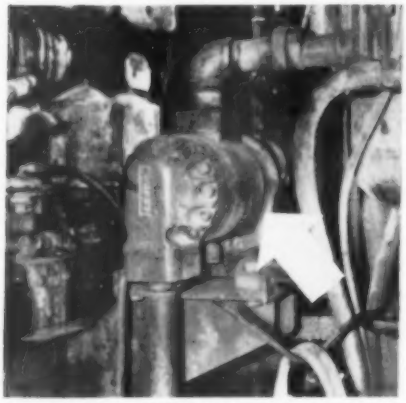


...prevents lost tools, increases production speed



One of the Denison 2000 psi vane-type hydraulic pumps used to power this effective adaptation of a drilling rig.

A drilling rig, adapted for workover service by the Harris Production Service Co., Long Beach, California, is another example of how Denison hydraulic equipment is helping to speed oil well drilling.

The rig consists of a 96-foot telescoping mast with a center extension ram and two side raising rams. The rig also contains a hydraulically driven rotary table, powered by a Denison vane-type fluid motor. A separate Denison vane-type hydraulic pump drives the fluid motor.

Rig-up time is kept to a minimum by speedily raising and extending the mast and drilling time is decreased by obtaining perfect torque control on the drill pipe through the rotary table drive. Torque control also prevents lost tools.

Three Denison vane-type pumps supply hydraulic oil at 2000 psi to the rams or to the rotary table. Ram speeds and rotary speeds are easily governed by selecting at will one, two or three pumps.

Let a Denison representative demonstrate the many benefits Denison hydraulic systems offer oil field operations. Write him today. Denison Engineering Division, American Brake Shoe Co., 1176 Dublin Road, Columbus 16, Ohio. Branch offices at: 2501 Bartlett Street, Houston 6, Texas; 208 Wright Building Annex, 3rd & Cheyenne, Tulsa, Oklahoma; 565 North Prairie Avenue, Hawthorne, California.

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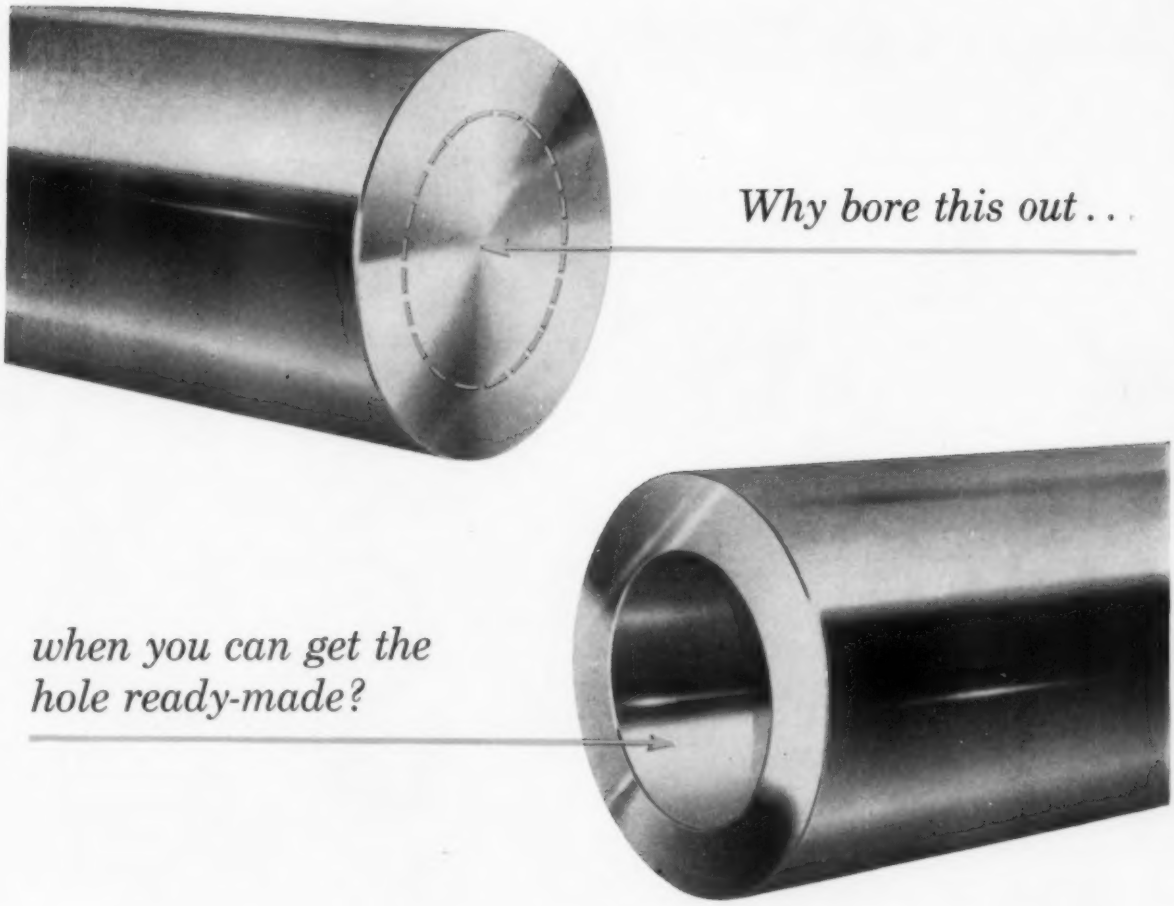


Save money on hollow parts by switching from bar stock to TIMKEN® seamless steel tubing

Check these savings you get when you make hollow parts with Timken® seamless steel tubing instead of bar stock:

1. **NO HOLE TO DRILL**—it's already there.
2. **ELIMINATION OF COSTLY BORING OPERATION** frees part of your screw machines for other jobs—adds machining capacity *without* adding machines.
3. **MORE PARTS PER TON OF STEEL** because there's less metal to hog out.

And with Timken seamless steel tubing you get better quality finished products. The piercing operation by which Timken seamless steel tubing is made gives the tubing its fine forged quality. A solid round is forged over a mandrel, thoroughly working the metal inside and out. Accurate temperature and piercing speed control combine to produce uniform, fine forged quality. And we maintain this quality from tube to tube, heat to heat, order to order.

Timken Company engineers are always ready to study your problems, recommend the most economical tube size for your hollow parts job—a size guaranteed to clean up to your dimensions. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

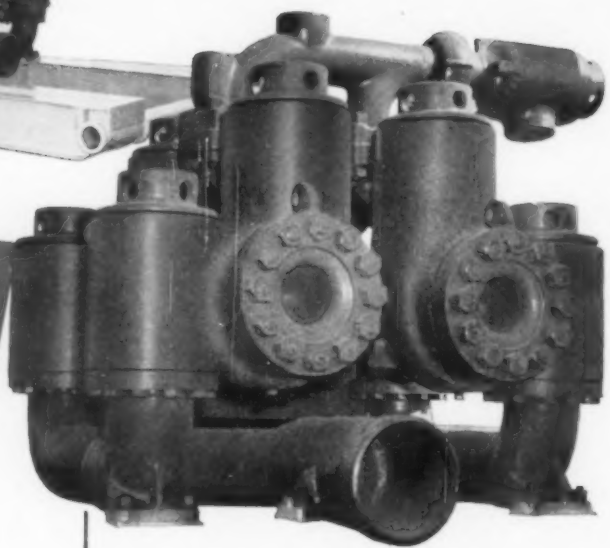
TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

Where You Need a "HE-MAN" Pump

Ready for shipment, this Emsco DA-850 with Mid-Continent Swinging pump drive is scheduled for service in Venezuela.

EMSCO DA-850



INSTALLATION ENGINEERED

by MID-CONTINENT

You get *more* with an Emsco DA-850 from Mid-Continent. Expert installation engineering is available to help you get top pump performance. Mid-Continent's field parts stocks simplify your field operations. Mid-Continent's around-the-world equipment supply is always near, wherever your location — the muskeg of Canada, offshore Louisiana, or Venezuela. Call your Mid-Continent man for complete mud pump information.

FIELD-PROVEN FLUID END DESIGN INCREASES EFFICIENCY; SIMPLIFIES MAINTENANCE

THREADED VALVE POT COVERS field proven over eight years permit quick and easy access to valves.

EXPOSED LINER CONSTRUCTION field proven over fifteen years. Lessens possibility of fluid end washouts.

STEEL FLUID END is composed of steel castings electrically welded into integral units for maximum strength and minimum weight.

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MID-CONTINENT Supply Company

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logging can begin on time, on schedule to save you money

A well-planned and executed mud program can save money all along the line. For example, when the mud is properly conditioned for logging, with the proper weight, the right viscosity, correct gel strength, etc., logging proceeds on schedule without costly delay. Your well is ready for logging as soon as the desired depth is reached. When desired, mud resistivity can be controlled to improve log interpretation. To help you in both the planning and the execution of your mud program, the Magcobar team will work right along with you.

Magcobar's complete drilling mud service brings you the right drilling mud chemicals for each foot of hole. Magcobar's mud engineers are the best trained and best qualified in the mud industry. The full facilities of Magcobar can help you to lower the over-all cost per foot of hole drilled. Plan now to make full use of Magcobar's *complete* drilling mud service on your next well.

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Magcobar®
Complete
DRILLING MUD SERVICE

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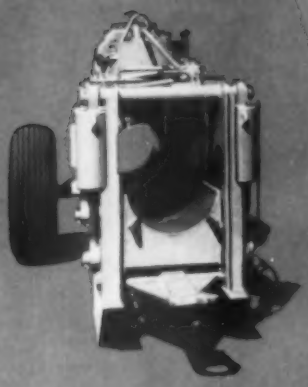
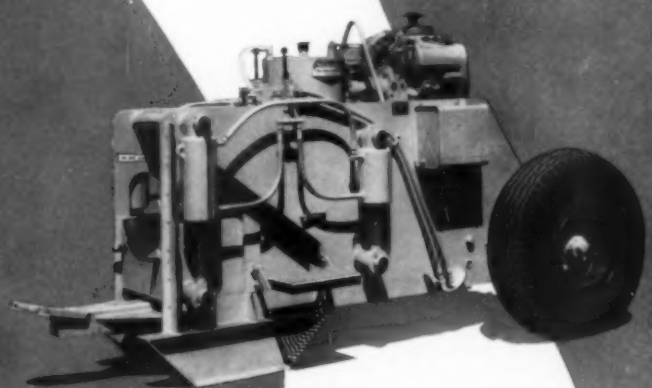
YOU CAN'T BEAT A CINCH



NEW CINCH VERTICAL MACHINE BENDS 6″-20″ PIPE MORE EASILY AND ECONOMICALLY



• MOVES ANYWHERE — overall width only 6'8″, mounted on toughest rubber tires • LIGHTWEIGHT — approx. 8400 lbs. complete with bending set • SIMPLE HYDRAULIC OPERATION — broken cable and other mechanical shutdowns eliminated, extra smooth bending power • SCRATCH-FREE, DEGREE-CONTROLLED BENDS — made closer to end of joint.

This new Cinch pipe bending machine already is in operation from coast to coast. Its hydraulic action gives it the extra power to bend quickly and smoothly ½-inch wall pipe up to 20″ in diameter. Its light weight, compactness, bending power and simplicity are unmatched.

Crose offers two additional Cinch models for bending pipe 16″-30″ and 22″-36″ in diameter.

CINCH

The J. Crose MANUFACTURING COMPANY, INC.

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They Say—

Wisdom of plan doubted

"If the oil companies accede to the President's request (on imports), the tendency will be to reduce the supply of oil coming onto the domestic market, which in turn will tend to inflate prices for gasoline and other oil products.

"The President's action is an obvious attempt at government interference with the free play of the market forces of supply and demand. It contradicts the often-expressed policy of seeking the freest possible internanal exchange of goods and services.

"... But perhaps most fundamental is the contradiction between this move and the ever-darkening picture of our oil-reserve situation. At the end of last year our proved crude-oil reserves were equivalent to only 11.8 years' supply at the 1956 rate of production. It is becoming increasingly difficult and expensive to find new oil supplies within our territory, and it has been estimated that it now requires 6 to 10 times the effort and cost to find a new barrel of oil here as compared with less than two decades ago.

"... The case would seem irrefutable that we should encourage the use of imported oil while conserving our own known domestic oil supplies against the possibility of future emergencies. Yet the President proposes, in effect, that we speed up the use of our own oil.

"... Our oil resources are finite ... We are using them up at a rate which must give rise to concern for all interested in the future welfare of this nation. There are many ways to encourage exploration for oil, whether by private or other interests. But every barrel of our oil used up is an irreplaceable resource gone forever, never again to be available for our future needs."

Editorial, The New York Times.

Eisenhower's exploration

Here's the full text of President Eisenhower's statements on imports at his press conference July 31:

"Well, I will only say this: That the whole present approach to this business of controlling our oil imports, regulating oil imports, arises out of one thing: Consideration of the national security.

"As a straight economic or as a straight political question affecting our relationship with other countries economically and commercially, it probably is not a good thing to touch. We ought to deal otherwise. But the national security demands this: A healthy oil industry in the United States in event of emergency.

"We have established, I think beyond doubt, that in emergency the Western Hemisphere can supply the petroleum needs, requirements, of the Western World for a limited time, but we cannot do it forever. But we can do that only if there is continued exploration and maintenance of reserves in this country.

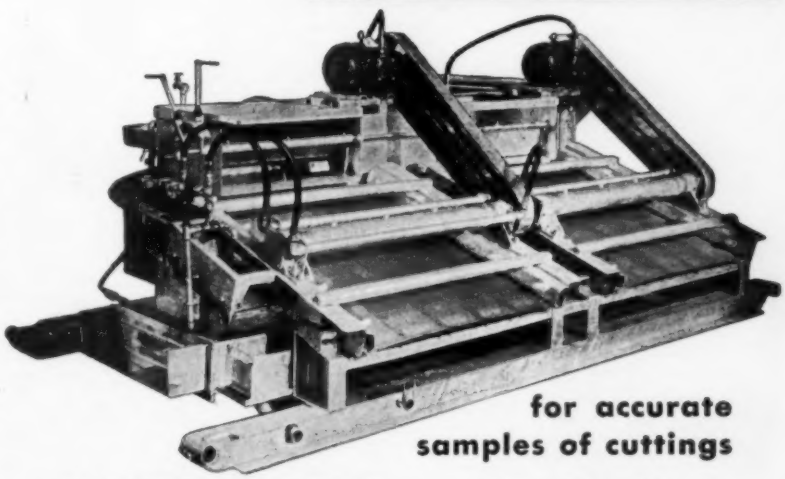
"If it were simple—so simple that you could say 'lets close up all our wells, import all our oil'—that might be a very cheap and temporarily successful policy. But you would strangle the oil industry and there would be none in this country, and so when an emergency came, it would not be a flourishing industry, and you couldn't depend on it."

The President was asked whether there is danger of the West Coast becoming dependent upon foreign oil. He replied:

"Well, that is not entirely true. They have quite a bit of oil out there themselves and, in addition to that, we are going to have to depend on

Thompson

DOUBLE VIBRATING SHALE SHAKER...and SAMPLE MACHINE



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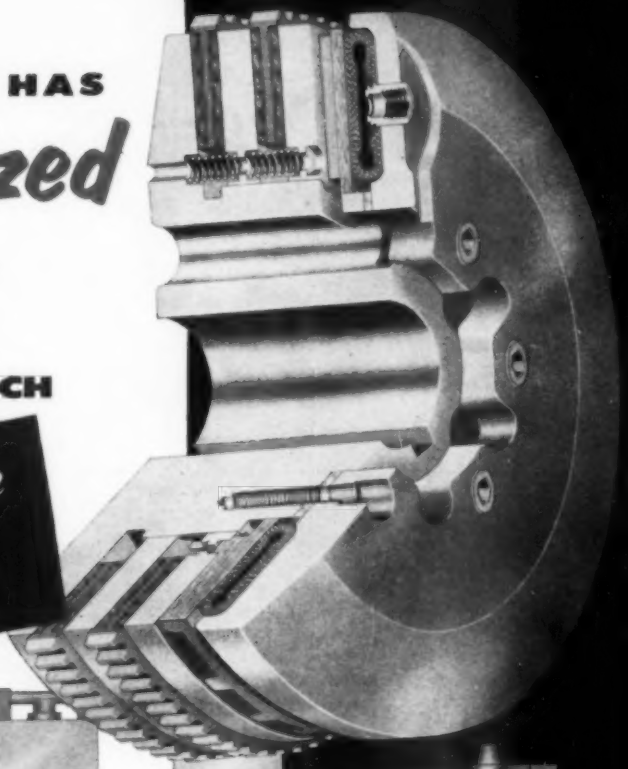

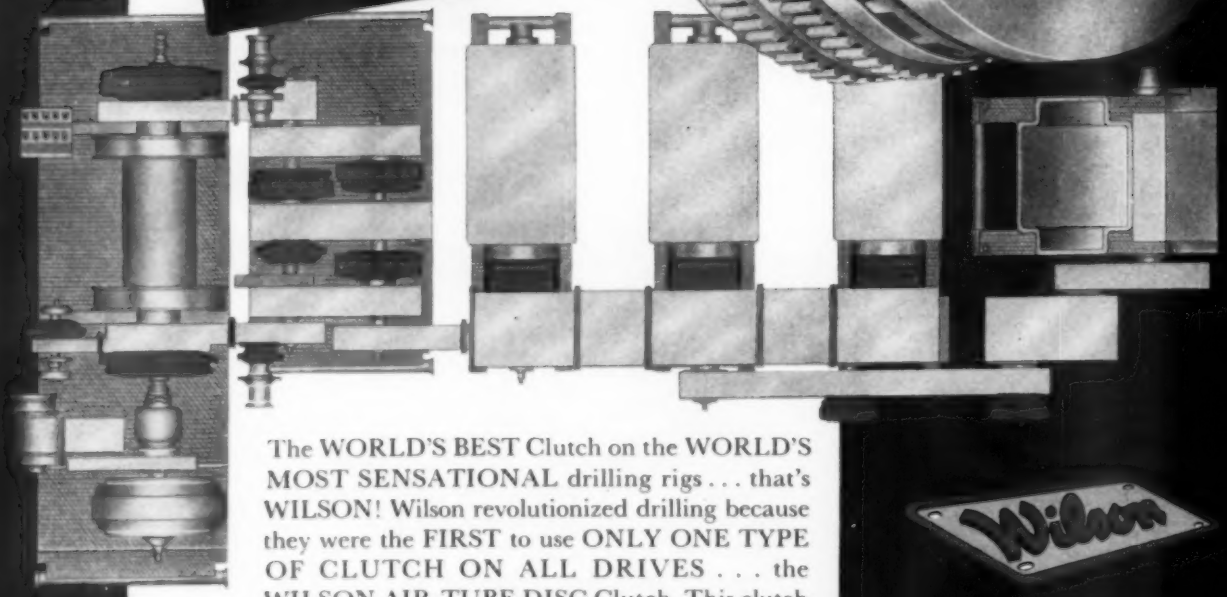

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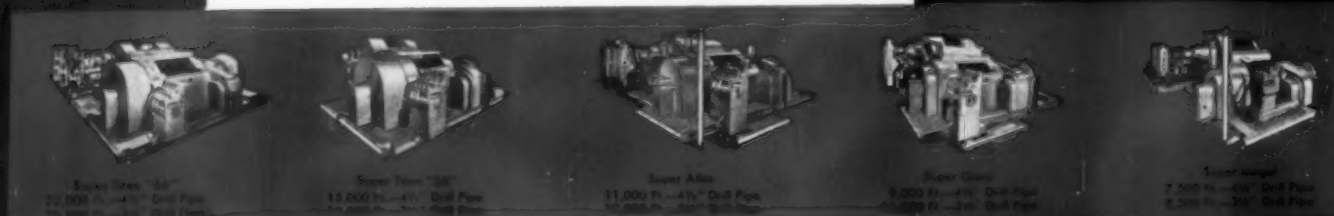

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water; we are going to have to depend on Venezuelan oil; make no mistake, we are not going to supply all of the oil that we produce anywhere."

The President was asked whether the depletion provision was not incentive enough for domestic producers. He replied:

"Well, I think that the 27.5 per cent depletion allowance was put into the law for that purpose, to encourage exploration, and it certainly does. But the facts are that when you have allowables in the great producing states reduced to about 12 or 13 days a month, they get to the point that they are not interested in further exploration.

"Now, this thing has been under study for 3 years. There is no easy answer. I tell you, if it were an easy one, you wouldn't have to study it this long.

"It isn't a question of trying to help big oil companies, I assure you. The big oil companies are the ones that are cut back. It is the large domestic producers and importers who are cut back under this plan, and it is the small local producers; and I say small, relatively small, who ought to profit."

A hopeless task?

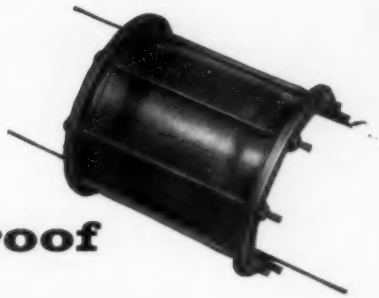
"It is unquestionably true that the importation of foreign oil is painful to domestic producers.

"In most oil states production is restricted (in the name of conservation) already. Today oil can be pumped out of Kuwait, shipped across the ocean and sold in the U. S. cheaper than the domestic price. This is not encouraging to those who have oil wells or who want to search for new ones. And we are not unsympathetic to this aspect of the case of the domestic oil producing states. Cheaper foreign imports are always painful to those who produce the commodity in question here at home.

"But this does not strike us as a sufficient reason for the Government to restrict oil imports.

"For one thing, the intended effect of the restriction is to support the price of oil. The price rise that helps the producer hurts the consumer. In effect, the consumer is told that he cannot buy his oil cheaper from Kuwait; he has to pay whtever is determined to be the 'proper' domestic price. As in the case of tariffs or other restrictive devices on any industry, the whole economy is denied the benefits of a free market.

"Equally important, it seems to us, is that the Government has undertaken a hopeless task. Even the domestic



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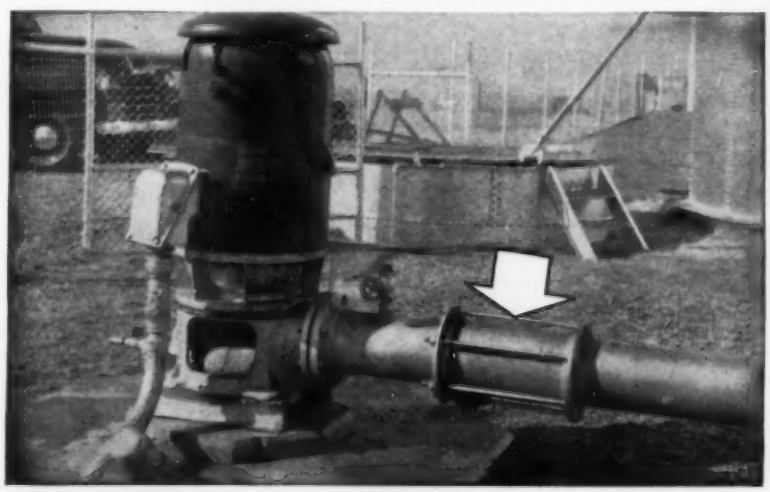
Dresser 8" Style 40 Long Sleeve on water well hookup in cycling plant



Style 38 Coupling

Style 40 Long Sleeve

Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

oil producers . . . concede we need some foreign imports. The Government has now taken upon itself the responsibility of deciding precisely how many barrels of foreign oil is exactly the 'right' amount.

"This brings a tremendous area of the oil industry under the thumb of Government. With the authority to turn on and off the faucet of foreign imports, the Government will have a powerful lever which can be used to the disadvantage as well as the advantage of the domestic oil industry, a thing that the industry itself might think more about. It will also have a lever that will play havoc if the officials in charge happen to push it the wrong way.

"The argument that all of this is necessary in the name of conservation is hardly convincing. And the remedy of coercive state planning is always dangerous."

Editorial, Wall Street Journal.

Gas competition grows

"There appears to be no decisive reason why market competition cannot generally regulate the field price of natural gas in the public interest.

"As a rule we turn to direct regulation of price only in cases of 'natural' monopoly in some essential industry . . . The structure of the gas industry, however, exhibits no high degree of concentration.

"Public-utility regulation always works imperfectly. It is wholly inappropriate for competitive industries . . . The structure of natural-gas production has become more competitive in recent years, not less."

James W. McKie, professor of economics and business administration, Vanderbilt University, in a study for American Enterprise Association.

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The Fabricated Star Bit shown here has been designed especially for big hole drilling in hard formations. Far more efficient than the old style spudding bit and the big hole paddle-type bit, these Star Bits are custom-engineered to suit the particular hole size and the capacity of the drilling machine used.

Spang Fabricated Star Bits save labor and money. They can be quickly dressed to gauge, and speedily ready for drilling, by hard surfacing the cutting edge.

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CALENDAR

AUGUST

19-20 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.
26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.
28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.
5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.
8-13 American Chemical Society, 132nd national meeting, New York City.
9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.
9-11 American Institute of Electrical Engineers, conference of the petroleum industry committee, Sheraton Hotel, Philadelphia.
11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.
19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.
22-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.
23-25 American Society of Mechanical Engineers, fall meeting, Statler Hotel, Hartford, Conn.
25 Natural Gasoline Association of America, regional meeting, Northern Hotel, Billings, Mont.
26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.
26-27 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, Roosevelt Hotel, New Orleans.
30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

OCTOBER

1-2 Texas Mid-Continent Oil and Gas Association, thirty-eighth annual meeting, Texas Hotel, Fort Worth.
1-4 National Association of Corrosion Engineers, north-central region, Sherman Hotel, Chicago.
1-4 National Association of Corrosion Engineers, south-central region, municipal auditorium, Oklahoma City.

2-4 Golden Trend Oil Show, Pauls Valley, Okla.

6-9 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fall meeting, Adolphus, Baker, and Statler Hilton Hotels, Dallas.

7-9 National Electronics Conference, thirteenth annual meeting, Hotel Sherman, Chicago.

7-9 American Gas Association, annual convention, Kiel Auditorium, St. Louis.

7-11 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

10-11 California Natural Gasoline Association, thirty-second annual fall meeting, Huntington-Sheraton Hotel, Pasadena.

10-12 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, fuels conference, Chateau Frontenac, Quebec.

10-13 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

13-15 American Association of Oilwell Drilling Contractors, seventeenth annual meeting, Mayo Hotel, Tulsa.

13-19 OIL PROGRESS WEEK.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southern California petroleum section, fall meeting, Biltmore Hotel, Los Angeles.

17-19 Four Corners Geological Society, second field conference, Gallup, N. M.

18 American Institute of Chemical Engineers, South Texas section, twelfth annual technical meeting, Moody Convention Center, Galveston, Tex.

20-22 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Peabody, Memphis.

23-25 National Association of Corrosion Engineers, western region, seventh annual conference, U S. Grant Hotel, San Diego, Calif.

23-25 National Association of Corrosion Engineers, seventh biennial Permian basin corrosion tour, Midland-Odessa area, Texas.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington-Youree and Captain Shreve Hotels, Shreveport.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional meeting, Education Building, Fairgrounds, Tulsa.

NOVEMBER

3-8 Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.

6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.

11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

12-14 National Association of Corrosion Engineers, northwest region fall meeting, Penn-Sheraton Hotel, Pittsburgh.

22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

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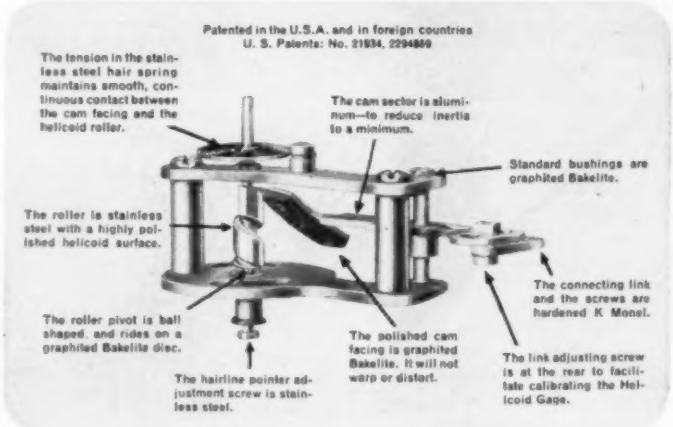
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U. S. Patents: No. 21934, 2294889
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The cam sector is aluminum—to reduce inertia to a minimum.
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The roller is stainless steel with a highly polished helicoid surface.
The connecting link and the screws are hardened K Monel.
The roller pivot is ball shaped, and rides on a graphited Bakelite disc.
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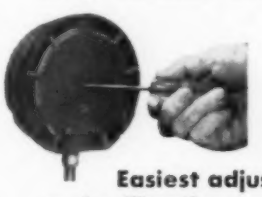

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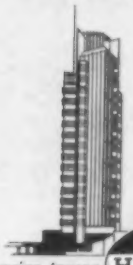

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the OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Imports Brainstormed

GREAT IS the power of the Journal's editorials. They really get results.

Couple of months ago our favorite oil publication ran a "leader" (as the British call it) or a "heavy" (as our composing room calls it) suggesting a nationwide "brainstorming" to develop brand new and entirely novel ideas for restricting imports—something original and different that would fit the needs of the oil industry and solve this thorny problem once and for all.

Well, it worked. Ideas were really generated. And some of them are lulus.

We have no way of knowing all the suggestions that were poured in on the Office of Defense Mobilization and the other Washington officials who have been wrestling with the imports matter. But a few stray ideas have come our way.

And since the administration has now come out with its own plan for controlling imports there should be no harm in disclosing these, though we will keep their origin cloaked in the deepest anonymity. Here are some of the brainstorming results in barest outline:

1. Apply allowables to tanker unloadings. Any importer could bring in as many tankerloads of foreign oil as he wanted to, just as domestic producers can drill as many wells as they please. But tankers could be unloaded only at a certain rate per day, just as domestic wells are allowed to produce only so much per day. For example, each tanker might be permitted to unload 30 bbl. per day, which is about the average per well production in the Mid-Continent. Or they could unload only 13 days per month, the same as Texas producing days. Now there's a plan that seems completely fair and equitable.

2. Require importers to maintain a national-defense reserve. For every barrel of crude imported, the importer would have to have 1 barrel of domestic producing capacity maintained in the ground in standby condition. This would give every importer his choice of using foreign or domestic crude—no tariffs, no quotas, no government interference. We would use foreign oil whenever it is cheaper than domestic but at the same time we would always have a reserve capacity equal to our imports volume that we could fall back on in case of emergency. Pretty neat, eh?

3. Relate imports to the price of gasoline. First, figure out a "proper" price for gasoline in this country. This would be based on all pertinent factors, including fairness to motorists, refinery margins, crude-producing costs, and maintenance of adequate reserves and sound conservation practices. Then, if gasoline goes above this price, let in more imports until the price goes down. Conversely, if the price falls below the "proper" level, squeeze off imports until it rises. There you have it—complete protection for consumers and everybody else (assuming that the politicians could ever reach an agreement on what the price of gasoline ought to be).

4. Issue green stamps. For every barrel of domestic crude run by a refiner, the Government would issue green stamps good for (say) one-tenth of a barrel of foreign crude. No crude could be imported without turning in green stamps at the customs house. Refineries that can't or don't want to use foreign crude could sell their stamps to some would-be importer for whatever price they could get. In this way the Government wouldn't set quotas, and the cost of foreign crude would depend in large part on how high importers bid up the prices of the green stamps.

Now there are four quite different and certainly novel ideas for getting away from straight tariffs or old-style quotas, avoiding discrimination among foreign nations, and keeping the Government out of detailed regulation of the oil industry. And if the administration's new plan ever needs revision, maybe some of these will be dusted off.

Don't ever say the Big Yellow Book doesn't get results. The ODM ought to be very grateful to us for prompting the flow of such thought-provoking suggestions, even though it didn't adopt any of them.

—Henry D. Ralph.

Warren
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How oil gets smeared for political ends

DEPARTMENT OF JUSTICE officials are said to be shocked and chagrined at the language of the District Court's opinion in dismissing the Government suit against the Caltex group of oil companies.

They ought to be. They had it coming to them. This suit (and companion cases against other American oil companies) was inspired by politics, pure and simple. The court found no facts to support it.

The suit was filed with great attendant publicity by the Truman administration just before the election in 1952. The Eisenhower administration modified it some, but business baiters in the department kept it pending for 5 years. Both administrations tried to make political hay out of this unjustified attack on the oil industry.

The facts are technical and involved. The Government alleged that American companies had charged excessive prices for Middle East oil sold in Europe and paid for with Marshall Plan funds.

TO SUPPORT THIS CHARGE the department cooked up a complicated formula for determining what it thought the price should have been. The court said this was ridiculous. It dismissed the complaint and castigated the department for bringing it.

This clears the defendants—on the books. But it doesn't erase the harm that the suit brought to the companies, to the entire oil industry, and to the prestige of the United States abroad. Nothing can undo that.

When the suit was filed the word went around the globe that the United States Government had officially branded all its international oil companies as crooks, cheaters, and criminals—the same companies that the Government was backing to obtain foreign development concessions.

THIS WAS MARVELOUS GRIST for the propaganda mills of America's enemies, and they made the most of it. The time, it must be remembered, was during the Korean war. The incident did untold damage to the reputation of America and American business methods.

At home, where political chicanery is better understood and some people still regard an accused as innocent until proved guilty, this irresponsible suit did great harm also.

During the 5 years the suits were kept pending without trial, propagandists and demagogs parlayed the technical allegations into generalized insinuations that the entire oil industry is gouging and untrustworthy. Big companies and little, majors and independents, foreign and domestic, were tarred with this stick.

Even some segments of the oil industry itself, feuding with the indicted companies, perpetuated the canard to the detriment of their own public standing.

Unfortunately the court's vindication of the companies and condemnation of the accusers will never cleanse this stigma from the industry.

Good Wells Make Good News

August 12, 1957

CEALMENT*—a Dowell-developed cementing service that uses a special latex-cement—has gained a wide reputation for helping well operators solve difficult drilling, producing and workover problems. Here are four recent examples.

- **White County, Illinois** (Old Well): Operator planned deepening well to Benoist sand at 2728 to 2740 feet. Two prolific water sands at 2300 and 2500 feet had channeled behind liner and given trouble in at least three other wells in the area. Liner was cemented with Cealment, using 975 gallons of latex-cement. After the well was perforated and fractured, *it made 400 bopd with no water from upper sands.*

- **Stonewall County, North Texas** (New Well): Drilled into Flowers Canyon sand and perforated at five zones between 4331 and 4473 feet. Each zone fractured separately. On previous wells in this field, results were erratic and failures were caused frequently by channeling between zones during fracturing. On this well operator used Cealment to "tail in". *No trace of channeling between zones, and well tested 85 bopd.*

- **Lea County, New Mexico** (Well being drilled): Bottom joint of 9⅝-inch intermediate string, at 5500 feet, parted during drilling operations. Two conventional cement jobs failed to hold. Dowell was called in to repair break with Cealment. Drill pipe was run in with drillable cement retainer on bottom to lift pipe into place. Circulating sub was placed just above break to permit spotting of 500 gallons of latex-cement. Metal ball dropped down pipe to block retainer and excess cement was reversed out. After setting of latex-cement, *casing was successfully tension-tested to 5000 pounds.*

- **St. Martin Parish, Louisiana** (Well being drilled): Operator lost circulation and had difficulty with sloughing shale between 9404 and 9874 feet. 12 squeeze jobs, including two of 1000 sacks each, failed to restore circulation. Operator then tried Cealment using latex-cement. *After single treatment, operator resumed drilling and was getting full returns while using 17.7 pound mud.*

Cealment can help you repair casing, set liners, set long strings, isolate zones, restore lost circulation or squeeze off unwanted zones. For full information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write Dowell Incorporated, Tulsa 1, Oklahoma.

Services for the oil industry

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the OIL AND GAS JOURNAL

August 12, 1957

Tubular Goods Are Going Begging

Tubular Goods: All sizes are plentiful. Large-diameter casing is tight on the Gulf Coast, where deeper drilling prevails, but soft elsewhere.

Line Pipe: Plenty is available except for big-dimension stuff, which will be short for months.

Other Goods: It's the same story. Even pumping units, for which a big last-half demand was expected, are plentiful.

"YOU NAME IT, we got it."

That's the pitch today of one supply-company representative.

Another says his company is considering an advertisement like this: "Our warehouse is full—Come and get it."

All firms selling steel to the oil industry agree on one thing: Supply has quickly changed from a sellers' market to a buyers' market.

Their representatives within a few months quickly have changed hats. They've converted from order takers into hard-working salesmen.

What's the trouble? . . . Plight of the oil-supply business actually is a symptom of general conditions in the oil industry.

The sloppy market stems from a variety of factors: Less drilling, heavily prorated production, high crude and product stocks, lack of capital, smaller consumer demand than expected, uncertainty over imports, and a sidewise movement of the general business economy.

The market began to ease late last winter. It became softer with spring (OGJ, June 17, p. 98) and is deteriorating further so far in the last half.

With more steel available oil men are ordering less.

It points up what one supply man says about his business: It's either feast or famine. When supplies are tight, oil companies order more and carry heavy inventories. That tends to aggravate the tight market.

But when supplies are soft, they cut inventories, order for immediate needs. That tends to make the market even softer.

Purchasing agents for the oil companies also confirm they are placing smaller orders and even canceling some for the third quarter.

Several factors are behind this trend—changed inventory policies, higher steel prices, the slump in drilling, and continued uncertainty over imports.

1. The Inventory Switch

One big company for several years carried a 6-month inventory, but now it's cutting stocks down to 2 months. Another with a 4-month inventory policy is reducing his to 2 months. Others say they have reexamined their stocks and now are ordering only for short-term needs.

Actually what is happening on inventories is this: The companies are forcing the mills to assume more of the burden of warehousing steel goods. Under present supply conditions, a 2-month inventory is the equivalent of 4 or even 6 months when the market was tight and deliveries uncertain.

An operator with a 2-month supply can count on getting a mill delivery within about 2 months. So on a given day he can quickly line up a 4-month supply or even longer by staggering his orders and deliveries. In the meantime, he has not tied up capital in steel goods or taken on the added expense of handling and storing the goods until they are needed.

One tubular-goods supplier blames slack sales squarely on inventory cutting—but such a trend, he says, is reasonable: "The oil companies are expecting the manufacturer to carry the inventory load, which is as it should be. The steel mills have been riding a gravy train in that they haven't had to carry any pipe inventory since the war."

Another thing is important, too: The major company knows now that if a sudden emergency arises, it can borrow enough drill pipe, casing, or line pipe from another major to tide over until it can get delivery on an order. Purchasing men say this is becoming a more common practice with steel plentiful.

2. Effect of Prices

Higher prices enter into the inventory picture. But nowhere did Journal editors uncover a concerted price resistance to explain the slump in buying.

Oil companies claim they never gamble on pipe. If they need it, they'll buy it at the going price. They don't buy to hedge on price increases, nor do they quit buying in anticipation of bargains when prices soften. They buy primarily on the basis of need and the future availability of steel.

The higher prices have one big ef-

fect: They make it more attractive for a company to carry a lower inventory. One purchasing agent for a major oil company said evidence of this is the fact that supply companies are offering protection against raises in prices between ordering and delivery time—provided oil companies place orders now.

3. The Drop in Drilling

Slump in drilling is the chief factor behind the supply problem.

Operators drilled only 25,761 wells in the first half of 1957, a drop of 3,007 from same period in 1956.

This has put a bigger pinch on the independent operator probably more than the major. The independent, with smaller resources, can't afford to carry an inventory of expensive steel goods if he isn't going to drill.

The result has been that many independents have started selling off the steel items they don't expect to use. This often has put them in competition with the supply houses on drill pipe and casing.

Operators generally expect to do more drilling during the last half of 1957 and have 29,673 wells planned —nearly 4,000 more than during the first half (OGJ, July 29, p. 130).

However, two majors told the Journal last week they are cutting their drilling programs. One blamed a depressed crude market and a lack of places to drill. The other blamed low allowables and lack of incentive and cash.

Uncertainty over what's ahead in imports, allowables, and domestic demand has played a big role in compelling all oil operators to be more cautious in their buying.

Some now express confidence this will change if the new imports-control formula works. Others see a worse slump in the fourth quarter even extending into the first quarter of 1958.

4. World-wide Lull

The situation generally is the same for all sections of the oil country. Some regional variations pop up, however.

Here's what Journal editors found:

... Houston. There's no great surplus of oil-country goods. Operators can't get mill shipments before the fourth quarter. Supply houses, however, are getting more cancellations than formerly, and this has softened the market.

Independents are hardest hit by 13-day production schedule in Texas. They've let up on buying the most as drilling activity heads off.

Several supply-company officials are confident the whole trend will be reversed by early 1958. One said he would wager "pipe will be plenty tight by then." He based the prediction on optimism expected to result from the move to control imports and on the fact that majors will have depleted their stocks by then.

... New York. Slow demand for tubular goods is world wide.

Companies with operations abroad also are living off inventories. They are deferring purchases and are slow to place advance orders. One export supply official said a "wait-and-see" attitude had developed among foreign companies. The decision on imports may discourage big drilling programs abroad while stimulating it in domestic areas, he added.

... Los Angeles. Plenty of steel is available. Companies are slowing down orders for fourth quarter because fewer wells are being drilled and officials don't want to build up inventories.

... Tulsa. Tubular goods are more plentiful than they've been in years. Oil men can get nearly anything they want. Orders for fourth-quarter delivery are slow.

... Dallas. The majors are cutting inventories. Fourth-quarter orders are well below third quarter and "considerably" below the second. Opinions differ as to whether drilling will be down the second half of 1957. Tight money, lack of capital, lack of incentive, low allowables—all are labeled culprits in the downward trend. Supply companies are more optimistic than the operators there will be an upturn in the drilling picture and equipment buying in the last quarter.

One supplier said there's a strong trend toward small casing (4½-in.) for slim-hole drilling. This saves operators 40 cents per foot over 5½-in., and transportation is cheaper.

The outlook ... Oil and supply men alike agree generally there are indications the trend will improve.

If drilling picks up in the last half as expected, it will improve the outlook greatly for supply houses. But new drilling may depend on demand, volume of imports, and need for domestic production. The general effect, however, may not come even then until the first quarter of 1958.

One supply man put it this way: "A price increase for crude would help us all—but let's quit dreaming."

New tool works in drill pipe:

Core Samples Pulled in Hurry

DENVER.—A new coring device has been designed to eliminate the time-consuming job of pulling drill pipe every time a core sample is needed.

Developed by Empire Oil Tool Co., the new drill-stem sampler is being tested in the Rocky Mountain area by major oil firms. Results will be available early in September.

The new tool could mean a big savings in time and money for the oil industry. Under present methods, before a core can be taken the drill pipe must be pulled from the hole, uncoupled, and racked.

Designed by M. A. Garrison, president of Empire, the new sampler can be lowered into the hole at any time, giving the geologist a fast check of any formation being drilled.

Average cutting into the side of the hole requires less than 5 minutes. The bit cuts a sample 4 to 5 in. long and about 1 in. in diameter.

How it works ... A wire line is used to remove a plug which seals the side outlet during drilling. A 7-ft. sampler is dropped into the pipe and pumped to the bottom.

Continued operation of the mud pumps causes a specially designed positive-displacement fluid motor in the tool to rotate a core bit at a 45° angle into the formation.

The new tool can take a sample at bottom or at any point above the bottom so long as a full-gage bit is on the string to center it in the hole.

When the sampler head has reached the full limit of travel, it retracts automatically into the body of the tool. The pressure on the surface pumps is then substantially reduced, signaling the driller that the coring cycle has been completed.

The sampler assembly is withdrawn through the drill pipe by a wire line and the undisturbed core is removed. Drilling operations are continued in the conventional manner.

During the coring cycle the drill stem is left motionless, but mud circulation is maintained.

Garrison said the tool could accommodate about 80 per cent of drilling operations. At present the tool can operate in any drill stem with an inside diameter of 2¾ in., but within 6 weeks the company plans to have tools ready to operate in 2¼-in. bores.

Test hits 19,078 ft. for . . .

. . . Texas Depth Record

FORT STOCKTON, Tex.—Texas' deep-drilling record collapsed last week.

A remote wildcat in Pecos County, West Texas, which a week earlier had erased the Permian basin depth record, punched on down to 19,078 ft. to also crack the former mark for the entire state.

The test is Pan American Petroleum Corp. and Gulf Oil Corp.'s 1-CS University, Section 27, Block 23, University land. It is roughly 13 miles southeast of Fort Stockton. At midweek operator was running electric logs at 19,078 ft. and preparing to drill deeper.

At that depth, the hole was 18 ft. deeper than the former record holder —Magnolia Petroleum Co.'s 417-A West Ranch in Jackson County on the Gulf Coast, which was bottomed dry at 19,060 ft. in September 1955.

The 1-CS University became West Texas' deepest when it passed 18,771 ft. This record was set late last year by Gulf Oil Corp.'s 1 P. G. Northrup to the northeast in adjoining Reeves County.

To go deeper . . . Prospects are that the test will be carried another 500 to 1,000 ft., barring trouble. This possibly could carry it to below 20,000 ft.

Pan Am, the operator, has had to extend its sights considerably on projected total depth since it spudded the well September 27, 1956.

The 1-CS University originally was set up as a test to the Ellenburger or to 16,000 ft., whichever came first. The 16,000-ft. depth came and went. And the project hadn't even reached the shallower Devonian. It still hasn't.

Pan Am now is concentrating on finding the Devonian and has given up hope on the Ellenburger. Company geologists think the well now is in the Barnett shale of the Mississippian. Their best estimates place the bit about 200 ft. into the Barnett.

The rig on the project can go to 20,000 ft.—deeper if need be. It is a big National steam-powered rig. Contractor is Parker Drilling Co., Tulsa, a veteran driller of wildcats.

The big question is condition of the hole. The project now has 2,600 ft. of open hole, mostly through shale, below the last string of 7⅞-in. casing set at 16,478 ft. And the operator is down to drilling a 6¼-in. hole.

So far the long stretch of open hole has held up well. If it should begin to cave heavily, however, the project couldn't be continued long.

The 1-CS University rig had been on the location 311 days as of August 7 and had chewed up 268 bits.

Wildcat is expensive . . . If the test does find oil, it could be a long time before it could pay out.

Besides the heavy cost of drilling, the companies also plunked down a staggering sum to lease the land.

The test is on a 3,840-acre block for which Pan Am paid the state $4,250,000 in June 1956.

Nearest production is from the Ellenburger at around 15,000 ft. in Puckett field 12 miles to the southeast. Gulf came into the picture in September 1956 when it and Pan Am agreed to split the risks through joint ownership of the block Pan Am bought and another in Crockett County which Gulf acquired at the same sale for $1,300,000.

Carter Extends Paradox Play

BLUFF, Utah.—Carter Oil Co. has pushed Paradox basin production another step to the northwest with a discovery 10 miles west of Aneth field.

The 4 Bluff Bench showed 1,020 ft. of oil on a drill-stem test at 5,602-26 ft. Nearest production is 4 miles to the east in West Recapture Creek pool.

This is only the second discovery of the summer for the big Utah play. During the spring, operators were finding new fields at the rate of one per week.

Carter's strike is the first since Shell Oil Co. 1 Tohonadla found oil in mid-May. This well, about 20 miles southeast of Aneth and 9 miles southwest of Carter's 4 Bluff Bench, flowed 528 bbl. daily on drill-stem test at 4,995-5,050 ft. It was completed in June.

Carter has about 5,000 acres in the immediate area and about 200,000 acres in the southern part of the Paradox basin, considered the hottest oil spot in the nation today.

The company's success ratio has improved greatly since the big exploratory program got under way in 1954. The first wildcat, the 1 Bluff Bench, was a dry hole, and so were 14 others that followed.

But the tide began to turn early this year. Since then, Carter has brought in five wells.

Operators in the Four Corners area are looking forward to completion of the 635-mile pipeline being built by Four Corners Pipe Line Co. The line will carry crude to the Los Angeles area when finished late this year.

Another crude line will carry Four Corners oil to Texas via Jal in southeastern New Mexico. The proposed 515-mile line will be built in 1958 by Texas-New Mexico Pipe Line Co.

Construction plans by both pipeline companies have spurred activity in Utah and New Mexico.

New Flood Uses Butane

● Greater oil recovery, lack of L.P.G. market prompt Cities Service to try solvent drive in Panhandle field

PAMPA, Tex.—Cities Service Oil Co. has jumped into the rush to field-test miscible-phase displacement as a secondary-recovery tool.

The company has launched a pilot project in the Brown dolomite under its Hughey "B" lease in the West Pampa portion of Panhandle field in Gray County, Texas.

It will go the popular L.P.G.-slug route, injecting L.P.G. then chasing it with dry gas.

The company will inject roughly 100,000 bbl. of product in 6 months through one input well, the Hughey "B" 10, and follow this with about 400,000 cu. ft. of gas a day.

One somewhat unusual feature is that the company will inject butane from the Pampa gasoline plant rather than propane used in most projects.

The pilot operation will affect about 40 acres of the lease. Throughout the rest of the 320 acres in the lease, Cities Service will continue a gas-injection program begun in 1946.

The company says it has a twofold incentive to start the pilot: To test "this latest method of secondary recovery in the Brown dolomite, and to use a surplus of butane which otherwise would be wasted because of a current lack of market."

Injection stepup . . . Sam S. Mabry, reservoir engineer for Cities Service, says maximum butane input so far has been 310 bbl. in 9 hours with maximum wellhead pressure during injection of 23 psi. Pressure builds up to about 150 psi. when the well is shut in. This should increase to about 450 psi. after the slug has been injected and the oil bank is built up and moved away from the input well.

Plans are to inject butane at an average rate of about 500 bbl. daily, depending upon the availability of butane.

Meanwhile, Cities Service will continue to inject dry gas through three other input wells at a rate of about 138,000 cu. ft. daily per well.

Oil hike expected . . . The gas-injection program in operation since 1946 is thought to have increased oil recovery by about 14 per cent for the repressured area over what could have been expected without the program.

Cities Service thinks the pilot L.P.G. slug operation will further cut down residual oil left behind — by about half.

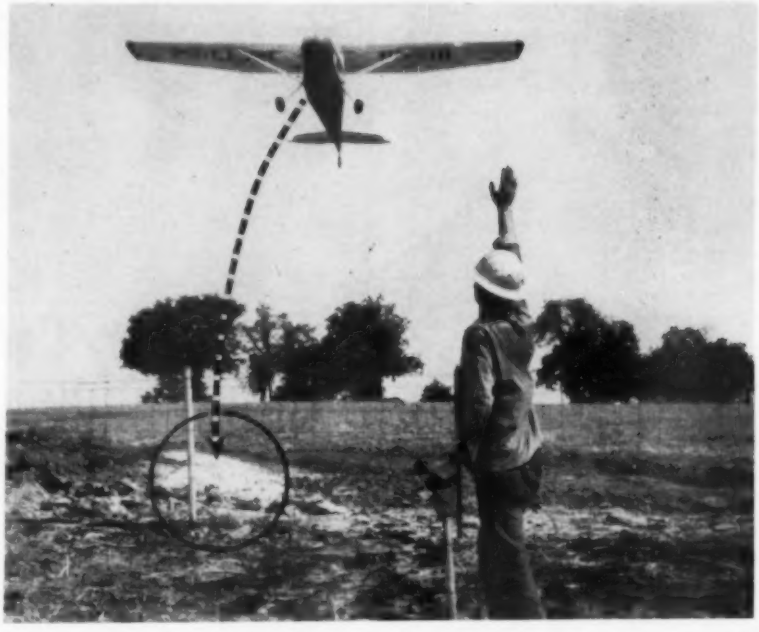
The company estimates oil in place presently under the 40-acre pilot area at 1,231,000 bbl. It thinks the butane slug will recover 420,000 bbl. of this and slash residual-oil saturation at abandonment to 26 per cent from 50.2 per cent.

The Hughey "B" lease, Mabry says, has produced 2,003,956 bbl. of oil to May 1, 1957. It is a part of a 12,005-acre field discovered in 1925 which still boasts 874 producing wells, along with 162 gas input wells.

The Brown dolomite in the area is topped about 3,200 ft., has an oil zone about 47 ft. thick on the average, and produces naturally via solution gas drive.

Original reservoir pressure of 450 psi. has declined now to an average of about 24 psi.

Cities Service received approval from the Texas Railroad Commission last week to continue the butane-slug pilot. Its application for continuation was backed by the West Pampa Repressuring Association.



Bright yellow and easy to find:

Powder "Bomb" Locates Leaks

TULSA.—For as long as planes have been patrolling pipelines, repair crews have had trouble finding many of the leaks reported by pilots.

The pilot, from his vantage point, can see telltale patches of oil or discolored soil that may be hidden from ground crews by grass or weeds. Changes in the color of the soil which may mean a gas or products leak sometimes are too subtle to be perceived from the ground. And the pilot in describing the suspicious spot may miss by 100 ft. or so.

This problem has largely been solved by Gleason Romans, Tulsa pipeline-patrol contractor. When his pilots spot a leak, washout, or other danger to the pipeline, it is splashed by a pound of brilliant yellow powder dropped in a paper bag. Red crepe-paper streamers also flag the location.

To make sure of an almost direct hit, the pilot approaches as low as possible. Sometimes he drops the bag from only 20 ft. above ground, if terrain is flat and treeless as it is in West Texas.

The marker was developed from a suggestion by a Texas Pipe Line Co. employe. After weeks of experimenting, Romans arrived at the type, color, and quantity of powder which satisfied him. It was tried for 6 weeks on one run. It worked so well that he's putting the marker service on all his flights in the Mid-Continent, Gulf Coast, Southwest, and California.

Praise, Defiance Greet Imports Plan

- Sun says it won't comply because of antitrust-law fears. Seven others leave the door open to jump either way, but 14 say flatly they'll comply with the order

- Carson is optimistic, and the nation's independents are enthusiastic about the plan. One exception is TIPRO, which wants "positive means" of enforcement

THE BIG QUESTION around the oil industry last week was: "Will the government's imports-control plan work?"

Cracks formed quickly in the dike thrown up by the administration to limit the flow of foreign crude into this country.

The government expressed optimism that it would get "good cooperation" from the 22 importers placed under a voluntary import formula. But replies from at least half a dozen of the companies raised serious doubt as to compliance.

Here were the major developments last week:

...Sun Oil Co. said flatly it will not follow the formula. It fears a violation of the nation's antitrust laws.

...Several other importers notified the government they want hearings to correct "inequities" in the formula. They left unanswered the question of compliance.

...The bulk of the nation's independent producers lauded the program. But one association of Texas independents demanded stricter control if "any" importer violates the formula.

...A House subcommittee announced plans for a future study of crude and product imports.

...Gov. Raymond Gary of Oklahoma launched a campaign for more drastic imports reduction (see p. 73).

...Two major crude buyers ordered proration in southwestern and southern states despite the new limit on imports.

Resistance of some importers to the control plan was not unexpected. Sun's statement that it will not comply, however, was a mild surprise. Sun's programed imports for the last half of 1957 were not cut nearly so sharply as others.

Tidewater Oil Co. was hardest hit and protested its formula but left the door open to compliance.

Despite the black clouds that formed over the program, Navy. Capt. M. V. Carson, Jr., the administrator, was optimistic. Said Carson: "We have received telegrams from the 22 oil importing companies. We are trying to digest and tabulate the replies. It appears that we are going to get very good cooperation."

Carson said hearings would be held soon for companies seeking changes in the formula. He will conduct the hearings and make most decisions—but any major breakthrough on the 1,031,000-bbl. daily limit would have to be approved by the cabinet committee on imports.

What they said . . . Fourteen of 22 importers told Carson they will comply with the formula. Some stipulated this was for the last half of 1957 only, while most agreed to a full year's compliance.

Five companies stated they plan to import more than the formula figure, but only Sun apparently put in writing the statement that it definitely would not comply. Standard Oil Co. of California took issue with the formula figures and contended it is entitled to slightly more, based on the 1954-56 3-year average less 10 per cent.

IMPORTS DIRECTOR is Capt. M. V. (Kit) Carson, Jr., 46. He's a Navy captain, lawyer, Texas graduate, and combat-ship commander.

Three companies failed to state specifically what they intend to import. Two of them, Tidewater and Atlantic Refining Co., asked for hearings.

Sinclair Refining Co. said it would comply but contended it suffered "discrimination" under the formula and sought a hearing.

Sinclair and Atlantic had this complaint: They complied with the 1954 voluntary import control plan and are now being penalized for it. Since the formula is based on the 3-year average, those which ignored the formula and imported more than their allotment received favored treatment.

Investigation? . . . In Washington, Rep. James Roosevelt, California Democrat and chairman of a House small-business subcommittee, said a study of imports "is a part of our future plans."

Roosevelt said his subcommittee may start collecting statistics late this year on crude-oil and product imports and hold public hearings next year.

The same subcommittee last week released a unanimous report on problems of gasoline retailing. The "future program" section of the report states that all phases of the petroleum industry are affected by imports, and the subcommittee is concerned with "the welfare" of crude-oil producers.

The independents . . . Leaders of the I.P.A.A. and 17 other associations stuck a solid stamp of approval on the import-limiting plan and issued a statement in Dallas heralding it as a "most important and constructive effort to limit oil imports in the interest of national security and the consuming public."

But one of the groups at the joint meeting later issued a separate statement not so laudatory. The Texas Independent Producers and Royalty Owners Association said that if any importer violated the formula, the program will be destroyed. A "substitute procedure" should then be put in effect, TIPRO said.

"It is our opinion that indications of unwillingness to comply . . . illustrate even before the program is fully under way that its most serious deficiency is the absence of some positive means for enforcing the established limits," said TIPRO.

The I.P.A.A. meeting in Dallas gave the import program powerful support. The independents, loud in

Importers Reaction to the Imports Plan

Here is a company-by-company rundown on plans for compliance or noncompliance with the Government's voluntary imports-control plan.

ATLANTIC—Says compliance would mean inequities and seeks audience with officials. Does not state whether will comply.

GULF—Will comply.

SINCLAIR—Claims it was penalized because it complied with 1954 formula. Seeks hearing. Indicates, however, will comply.

SOCONY—Will comply.

STANDARD OF CALIFORNIA—Says formula should be 67,100 bbl. daily instead of 66,800, based on 3-year average less 10 per cent.

STANDARD (N. J.)—Will comply.

THE TEXAS CO.—Will comply.

CITIES SERVICE—Will comply.

EASTERN STATES—Plans to import 22,800 bbl. daily. Formula says 18,300. New figure based on revised estimate by company.

GABRIEL—Will comply, but did not state exact amount of planned imports.

GREAT NORTHERN—Will comply but wants to present plan to use Canadian crude for substantial refinery expansion.

INTERNATIONAL—Will comply last half of 1957 but plans to raise imports from 10,900 to 13,000 bbl. daily first half 1958.

LAKEHEAD—Will comply.

LAKE SUPERIOR—Plans to import 6,500 bbl. daily, compared with 5,000 formula. Has new refining capacity in November, plans to use Canadian crude.

NORTHWESTERN—Will comply.

PHILLIPS—Will comply, but if new discoveries are made in Venezuela may petition for relaxation of formula.

SHELL—Will comply during last half of 1957.

STANDARD (INDIANA)—Will comply but wants hearing on hardship case. Needs asphalt crudes.

STANDARD (OHIO)—Will comply last half 1957, will seek increase first half 1958.

SUN—Will not comply because of antitrust laws. Plans to import 55,000 bbl. daily. Formula is 50,400.

TIDEWATER—Says would be placed in untenable position with competitors. Did not state how much it plans to import. Formula is 34,000.

SOUTHWESTERN—Will comply.

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their demand earlier for controls, were elated by what they got. But they aren't buying it blind.

They are pleased with the minimum of government control or interference contained in the plan, and they think it will work. If it doesn't, they will be ready to generate and apply heavy pressure for something with more teeth.

The important thing with the independents is that both the executive branch and Congress now fully recognize the problem of excessive oil imports.

Their joint statement said: "The government is now committed to a policy of limiting imports to a proper balance with domestic supplies. Under this policy, domestic producers can continue to provide ample oil at reasonable prices."

What they expect . . . Are the imports adequate? The independents appear satisfied. They estimated in last week's joint statement that domestic crude production under the plan will increase in the coming months by 200,000 to 400,000 bbl. per day over the present level.

"This would represent substantial relief . . . and should encourage domestic exploration and development," the statement said.

Is the method of control adequate? "Importing companies now have both an opportunity and a responsibility, and we urge their strict compliance," said the independents. "We commend the President and cabinet committee for the clear intent to impose mandatory controls if importing companies fail to comply with the specific quotas established for each company."

Independents were regarding the plan as more mandatory than voluntary. They said with satisfaction the administration is waving a big stick and the President can force compliance if necessary.

Sun's position . . . Sun took the lead in resisting the government plan. What happens in the Sun case may determine what happens to the entire program.

The company takes the position the voluntary agreement "may constitute steps toward cartel arrangements that are forbidden by the federal antitrust laws."

President Robert G. Dunlop of Sun told U. S. officials his company "cannot agree to join" the program but added that Sun is cutting its imports from 58,400 bbl. daily to 53,000 by the start of 1958 and to 50,000 by April 1, 1958. The imports formula for Sun, effective now, is 50,400.

Dunlop told the government: "Joint voluntary action restricting crude oil imports may be the beginning of undertakings in this field that would be destructive of the basic principles of competitive enterprise in this country and thus of individual freedom and opportunity."

Other objections . . . Tidewater and Atlantic Refining spoke out against the import policy as it applies to them. Their carefully worded statements left unanswered the question as to whther they would refuse to comply with the voluntary program if the "inequities" were not erased.

Said Tidewater: "Although the company opposes import restrictions in principle, it is willing to cooperate with the government on a short-term voluntary basis if proposed restrictions will leave Tidewater in a fair competitive position with other refineries in the East Coast area in which it operates."

Tidewater protested that the formula would cut its programed East Coast imports for the last half of 1957 by 60 per cent, and this would amount to nearly one-fourth of the total reduction for the area.

The company then lashed at the entire import policy as one that would increase consumer prices and punish the oil industry.

"There are dozens of other strategic materials for which the United States depends partially or wholly upon foreign sources . . . iron ore, natural rubber, chrome, aluminum and copper, to name only a few," said Tidewater. "The American consumer of petroleum might ask, 'Why single out oil?' "

Atlantic's public statement was more restrained. The company said it complied fully with the import restrictions under the 1954 formula but "will be confronted with serious inequities under its quota proposed by the new plan . . ."

Both Tidewater and Atlantic asked

for hearings to alter the formula as it applies to them.

Production picture . . . If any producers had hopes the new import policy would step up purchaser requirements immediately, they were quickly disillusioned.

Two major buyers—Gulf Oil Corp. and Esso Standard Oil Co. — announced purchaser proration for southern and southwestern states because of excessive stocks and a slowdown in refinery operations.

Gulf decided to reduce by 20 per cent its August purchases in Oklahoma, Louisiana, Mississippi, New Mexico, and Alabama. Esso knocked off 15 per cent in Louisiana and Mississippi and 5 per cent in Arkansas.

Gulf's reduction will amount to about 40,000 bbl. daily in the five affected states. Purchases ran to 200,000 bbl. daily in July.

The cutback was blamed by Gulf on failure of customer demand to meet the forecast figure.

A third firm preparing to prorate purchases is Rock Island Oil & Refining Co. The firm notified producers and operators in Oklahoma that a reduction will be necessary because of refinery strikes, excess stocks, and heavy imports and allowables in excess of market demand.

Oil-state governors to hear man-with-a-mission when . . .

Gary Asks Drastic Import Cut

OKLAHOMA'S Gov. Raymond Gary is taking to the sawdust trail to battle for a tougher federal import-control program.

Gary has called the executive committee of the Interstate Oil Compact Commission into special session for August 19—but he is doing far more than that.

Democrat Gary will make a flying tour of a half-dozen oil states to make a personal appeal to Republican governors for support of his program. Here's what he wants to do:

. . . **Cut imports** of crude oil 50 per cent.

. . . **Make the cut** mandatory.

. . . **Go to Congress** for a control law if the Eisenhower administration fails to move.

To promote interest in his campaign, Gary has a four-pronged plan of attack:

. . . **Ask the governors** of Kansas, Nebraska, South Dakota, North Dakota, Montana, and Utah for their personal support. All are Republicans except George Docking of Kansas.

. . . **Request official backing** from the Oil Compact executive committee at the August 19 meeting at Glacier National Park, Montana.

. . . **Call a meeting** in September or October in Oklahoma City of governors from Texas, Louisiana, Kansas, Arkansas, Mississippi, Colorado, New Mexico, and Oklahoma, and ask them to join the antiimport crusade.

. . . **Climax the campaign** with a call for united action of the entire Oil Compact organization at its December 1-3 meeting in Tulsa.

"The meeting of the Compact in December will be the most outstanding of the organization in recent years," Gary said. "The program will be centered around the import question.

"We want to stimulate interest in this program and arrive at some positive organized decision at the Tulsa meeting."

Gary said he appreciates the administration's new voluntary control plan to cut scheduled imports by 10 per cent—"but that's not sufficient. It's just a step in the right direction. It ought to be 50 per cent, and it ought to be mandatory."

Flight plan . . . The Oklahoma governor will launch his tour of midwestern and Rocky Mountain states August 16 by flying first to Topeka, Kans., to talk with Docking. Then he'll go to Pierre for a chat with South Dakota Gov. Joe Foss and to Bismarck for a visit with North Dakota Gov. John E. Davis.

On August 19 he will preside as chairman of the Compact executive committee at Glacier National Park and see Montana Gov. J. Hugo Aronson. The following day, en route home, he will stop at Salt Lake City to call on Utah Gov. George Dewey Clyde.

To catch another batch of oil-state governors, Gary will call a meeting of those from the Southwest in late September or early October.

Gary also expects to have some powerful ammunition for his crusade against imports when a special Oil Compact committee makes its report at the December meeting. Independent producer W. A. (Gus) Delaney of Ada, Okla., heads the committee, which was assigned the job of studying the effect of imports on oil conservation.

Gary first began organizing governors earlier this year at the national governors conference, where 32 members signed a resolution calling on President Eisenhower to control imports.

Acting now as the elected chief of the Oil Compact states, Gary says this: "My idea is to stimulate so much support for this program that if the President doesn't take action before Congress convenes again—then Congress will."

Imports-fight leaders W. W. Vaughey and R. L. Wood (right) tell reporters . . .

Why Independents Like Imports Plan

It's not voluntary, but it's good and it's workable. And it means the Government recognizes that imports do threaten national security.

These conclusions were reached last week in Dallas by representatives of 18 associations. They met at the request of the men at right in the photo —W. W. Vaughey, board chairman of I.P.A.A., and Robert L. Wood, I.P.A.A. president. Both have been leaders in the long fight to control excessive imports.

Here's what they—and many other independents—think about the Government's new imports-control plan:

Q. Do you feel that the cabinet committee's import-limiting plan is a good and workable one?

A. (Vaughey) Yes, we do. I would have liked to have seen the 1954 ratio maintained. But I think the new program is about the best solution that could have been devised for such a many-sided problem.

Q. Do you think importing companies will comply with the cabinet committee's import-limiting plan?

A. (Vaughey) Yes, I think they will.

Q. Why, in view of the failure of past government requests that importers voluntarily reduce imports, do you feel this way?

A. (Vaughey) This word "voluntary" has been kicked around for a long time. And its meaning now has changed . . . "voluntary" this time has a lot more teeth in it. This actually is not a voluntary plan. The cabinet committee's report to the President specifically says, if import quotas aren't followed, "You find that the national security is endangered" and act accordingly. I think all importers will see the danger of noncompliance.

(Wood) The program is backed up by the power of the President, and any failure to comply would be a challenge to governmental authority.

Q. There are reliable reports that Gordon Gray, ODM boss, reported to the President that a voluntary program wouldn't work following his talks with the importers last spring. Would you comment on this?

A. (Wood) I haven't heard anything about such a report (by Gray). But, I don't see that it would change things even if true. I still think importers must comply with the plan. I would hate to be in the shoes of the first firm to disregard it. If I got the order, I would obey it.

Q. Supposing one importer fails to comply, would that wreck the plan for the rest of them?

A. (Wood) Yes, I think it would.

Q. If this should happen, do you think the administration has mandatory controls ready now to impose quickly if need be?

A. (Vaughey) Yes. The machinery is already set up. The Secretary of the Interior has named a competent Navy captain to administer the present plan and this machinery could easily be adapted to a mandatory control program.

Q. If the voluntary program should break down, what sort of mandatory controls would you look for?

A. (Wood) I don't want to speculate on what means the Government might use to enforce imports cuts. We don't want to prejudge this issue. We think the present plan will work.

Q. There is reported to be a lot of resistance from such quarters as

the State Department to restricting imports. In view of this, and supposing reports of Gray's finding that a voluntary plan wouldn't work are true, do you think that the administration might possibly be stalling in hopes that the imports situation will work itself out if given time?

A. (Vaughey) I don't see any possibility of Government stalling. After all, it (the administration) didn't have to do anything. The present plan is the result of very careful study by the Government . . . years of it. It is not a spur-of-the-moment decision. The administration preferred not to have to act. It hoped the voluntary cooperation it has sought in the past would work. But it has now found that the national defense is in danger. We have no doubt that the administration is sincere.

Q. If so-called mandatory controls do become necessary, do you see any danger that it might spread eventually to government control of prices, etc.

A. (Wood) None at all. This is scare talk and nourished no doubt by importers. Controlling imports by quotas is not nearly so complex as importers would have folks believe. After all, several states have been doing essentially this same thing for years in regulating production allowables of domestic producers. Nearly everyone concedes that this is necessary and for the good of the producer and the consumer. The states haven't extended their conservation powers to also control oil prices. Why should federal setting of imports quotas work differently?

Q. The cabinet committee's plan, as announced, would cut imports back about 235,000 bbl. daily from those planned by importing firms for the last half of the year. How do you figure the "300,000 to 400,000-bbl.-daily increase in domestic production in coming months" mentioned in the joint report of the 18 associations?

A. (Vaughey) From three factors. First, the plan calls for a 235,000-bbl.-daily cut during the last half. Secondly, imports for July are already in the country and it is too late now for importers to revise schedules for August. Thus they will have to cut back to less than the daily recommended levels for the rest of the year to stay within their quotas. Thirdly, we look for a seasonal increase in demand during September - through-December period.

Q. How do domestic producers feel about the committee's decision to exclude West Coast imports from the program?

A. (Vaughey) Naturally we're disappointed about this. But we also are encouraged in that the plan calls for keeping a close watch on the West Coast situation. That's the nice thing about the plan . . . there's not too much rigidity. We feel that it is about the best that could be devised. Importers, for instance, are warned not to try to circumvent the purpose of the plan by switching to heavier product imports or importing for the account of an affiliate.

Q. Do you think there is any possibility that the administration may in a year or so revise the plan to give the importing firms a greater share of the U. S. market?

A. (Wood) No, we don't anticipate any upward revision of the basic (12 per cent of domestic production) percentage. The committee's plan specifically says that quotas for would-be future importers either will come out of an increase in domestic demand or by having older importers move over to make room. It thus rules out enlarging the total importer share of the domestic market to accommodate potential new importers.

Q. Do you think that the administration's called-for cut in imports is large enough to encourage more drilling and exploration in this country?

A. (Wood) We'll have to wait and see. This, as I see it, will be the barometer for seeing how well the plan is working.

Q. How soon do you look for an upswing in exploration if it should come?

A. (Wood) We should see the evidence as soon as it becomes apparent whether importing firms will comply with the cabinet committee plan.

Q. On the other side of the fence . . . do you think that the plan will cause any cut in foreign drilling and exploration?

A. (Wood) No, I don't see why it should. It should have a healthy effect on companies with production abroad in that it will cause them to develop other free-world markets. After all, importing firms are run by human beings and it's only human nature to seek the softest market until you're forced to do otherwise.

Q. Will the independent producer associations now abandon attempts to limit imports by congressional action?

A. (Wood) We plan to defer such action. Whether we abandon it or not depends on how well the new program works. We will maintain a watchful attitude.

Industry briefs

Atlantic Refining Co. will expand its Canadian exploratory program to include Alberta and British Columbia. The company has acquired acreage in the Pembina - Keystone and Virginia Hills areas of Alberta. Until recently Atlantic's drilling activities were limited to Saskatchewan.

McRae Oil & Gas Co. of Denver has purchased 24 producing wells in Kansas from Smitherman Drilling Co. The wells, producing "several hundred" barrels daily, are part of a water-flood unit southeast of Arkansas City in Cowley County. Purchase price was about $2,000,000.

Helmerich & Payne, Inc., of Tulsa has bought the drilling assets of Sabine Drilling Co. The sale included two rigs, 30,000 ft. of drill pipe, drilling tools, and other equipment.

One of the rigs is a National 110, capable of going to around 15,000 ft. The other is an Ideco, rated to about 10,000 ft. Both are located in West Texas, but one may be shipped to Venezuela where H.&P. has five rigs it recently purchased from Sinclair Oil & Refining Co. H.&P. operates 21 deep rigs in the U. S. It is a wholly owned subsidiary of White Eagle Oil Co. of Tulsa.

A gas reinjection program has been started by Ginther, Warren & Ginther in Nebraska's Dorman field, the largest producer in Cheyenne County. The program is expected to prolong the life of the field by 15 to 20 years and recover an additional 1,000,000 bbl. of oil.

Three new compressors were installed to handle the reinjection system, operated as part of the Dorman gas plant. Dry gas from the plant is raised to about 740 psi. and reinjected through a single well, one of 15 G.W.&G. wells pumping in the field. Dorman production last year was 421,264 bbl. of oil. Cumulative production from 1950 through 1956 was 2,360,434 bbl.

Shelton-Warren Oil Co. has been formed at Roswell, N. M., by Bill A. Shelton and Jess L. Warren. The new company will begin operations in Chaves County, New Mexico. Shelton, who formed Shelro Drilling Co. in 1955, and Warren, geologist from Abilene, Tex., first joined forces as partners last year.

Propylene is close on its heels but . . .

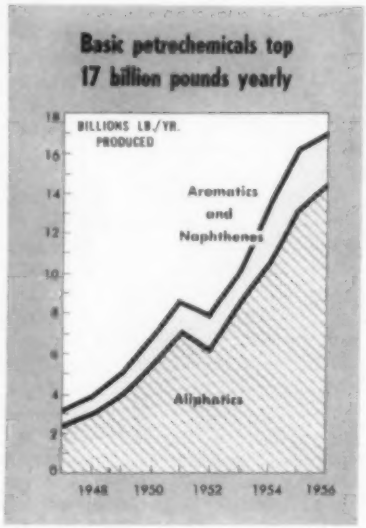
Ethylene Still Leads Petrochem Pack

ETHYLENE is still the fastest growing basic petrochemical. Not far behind is propylene while other light aliphatics are beginning to move briskly in the continued growth picture on chemicals from petroleum.

These trends are verified by the preliminary 1956 figures on crude products from petroleum and natural gas compiled by the U. S. Tariff Commission. The tariff commission figures (see table below) cover petrochemicals destined for end use as organic chemicals. They do not include fractions going into synthetic ammonia, sulfur, carbon black, and other products.

The 1956 report revealed no startling changes which were not anticipated. It does pin point some interesting trends and shows two important basics broken out separately for the first time.

The report reflects an over-all increase of about 9 per cent over 1955 in production of all basic petrochemicals reported. The 1956 total runs 17,673,394,000 lb. Production in 1955 was 16,178,962,000 lb.



Aliphatics star . . . The gain was shared about equally by aromatics and aliphatics But the star performers lie in the latter group.

Ethylene production jumped 554,133,000 lb. last year, a gain of 18 per cent over 1955. Much of this new output went into polyethylene. In a separate tariff commission report on plastics and resin materials, polyethylene output was shown at 565,705,000 lb. last year, a 40 per cent jump over 1955.

Propylene has begun to move. An even faster production pace is slated for the next few years. Last year for the first time, this basic olefin was reported separately, at 1,414,766,000 lb. In addition, 227,954,000 lb. of propane-propylene mixture was produced last year. No direct comparison is possible with 1955, but a gain of about 23 per cent is indicated.

Direct comparisons with previous years are not valid in some cases. Normal butane, for example, cannot be compared with 1955 production because of changes in some reports.

No exact comparison is possible on butadiene last year. The 1956 report includes for the first time a butadiene-butylene mix in addition to the figures on butadiene alone for the

Crude Organic Chemicals from Petroleum and Natural Gas

(Thousands of pounds per year)

	1956	1955	1954	1953	1952
Aromatics and Naphthenes:*					
Distillates and solvents	725,496	642,649	520,286	404,545	391,263
Benzene	818,123	722,650	673,715	462,105	255,730
Cresylic acid, crude	29,772	24,470	21,576	16,080	14,317
Naphthenic acids	22,937	16,687	23,666	23,123	19,319
Toluene	946,789	1,038,290	889,687	836,473	463,650
Xylenes, mixed†	894,580	699,455	726,041	749,010	443,804
Other cyclics‡	21,478	30,404	19,037	14,355	17,038
Total aromatics	3,459,175	3,174,605	2,874,008	2,505,691	1,605,121
Aliphatics:					
Methane		131,527	44,036		
Ethane	562,153	445,214	355,820	144,623	203,179
Ethylene§	3,602,358	3,048,225	2,344,644	2,135,740	1,809,495
Propane	2,181,141	2,007,140	1,675,124	1,366,175	580,139
Propylene-propane mix	227,954	1,331,475	1,203,501	1,222,622	996,282
Propylene	1,414,766				
1,3-Butadiene¶	1,277,618	1,411,285	808,731	1,152,197	1,106,445
Butadiene and butylene	412,399				
n-Butane	1,214,666	753,461	941,088	418,144	37,856
Butylenes**	1,006,659	1,171,596	1,214,756	906,732	825,171
Isobutane	450,777	444,532	250,055	155,589	
Isobutylenes	327,352	124,562			
Other C4††	124,921	663,748	852,640	534,507	404,178
C5 hydrocarbons‡‡	310,709	250,752	179,395	122,048	15,401
Di-isobutylene			21,997	23,157	25,325
Dodecene (propylene tetramer)	394,491	371,948	316,337	176,926	114,983
Nonene (propylene trimer)	105,084	146,204	98,557	60,986	
Other hydrocarbon derivatives§§	5,996	8,128	5,331	2,681	1,920
Other aliphatics¶¶	595,175	694,560	259,604	219,242	141,409
Total aliphatics	14,214,219	13,004,357	10,571,616	8,641,369	6,261,783
GRAND TOTAL	17,673,394	16,178,962	13,445,624	11,147,060	7,866,904

*Includes aromatics from petroleum sources only, excluding coal tar.

†Includes xylene blended in motor gasoline.

‡Includes sodium cresylate, 1,4-methane-2,5-cyclopentadiene, mixed pyridines, sodium phenolate and phenate, and hydrocarbon polymers.

§Includes a small amount of ethylene from coke-oven gas.

¶Includes some butadiene made from ethyl alcohol.

‖Not strictly comparable with 1955 figures because of changes by some companies in reporting production of subsidiaries.

**Represent principally the butene content of crude refinery gases from which butadiene is manufactured.

††Includes 1-butene, 2-butene, butane-butylene, and mixed olefins.

‡‡Includes pentanes, pentenes, isoprene and mixtures.

§§Includes di-tert-butyldisulfide, miscellaneous mercaptans, and aliphatic acids.

¶¶Includes methane, acetylene, di-isobutylene, hexanes, heptanes and heptenes, octanes and octenes, polybutene, eicosane, and hydrocarbon mixtures.

Source: U. S. Tariff Commission.

1,3-butadiene grade for synthetic rubber. Taken as a whole, all C_4 hydrocarbons chalked up a production total in excess of 4.8 million pounds, a gain of 5 per cent over 1955.

The basic petrochemicals with five carbon atoms are growing fast. They are still lumped in one figure which includes pentanes, pentenes, and isoprene, but their aggregate gain ran nearly 60 million pounds over 1955, a 24 per cent increase. This continues the stride in this new class of basics, which showed production of gains of over 70 million pounds in 1955 and nearly 60 million in 1954.

Aromatics steady . . . With the major exception of toluene, the aromatics and naphthenes from petroleum showed continued gains last year. Fractions of this type, sold as distillates and solvents, reflected the growing market with a 13 per cent boost amounting to more than 80 million pounds. Benzene from petroleum continues to move, gaining 13 per cent last year.

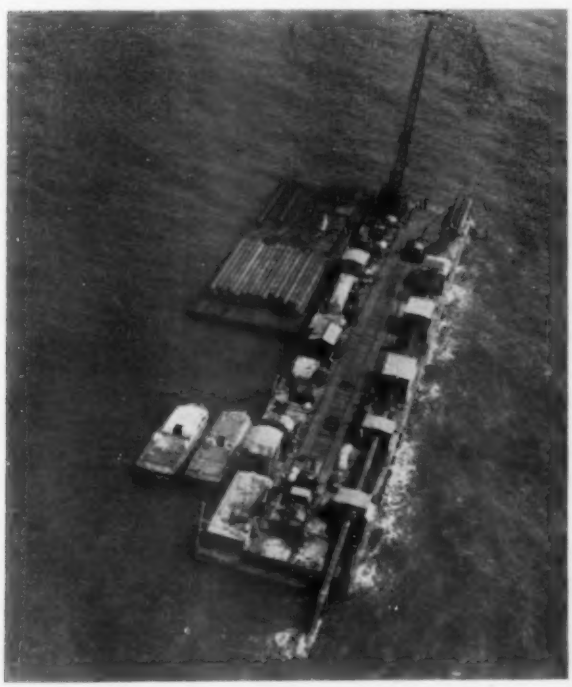
Toluene is soft today. Price reductions on petroleum-derived product broke from 2 to 3¾ cents per gallon last week making it competitive with coke-oven toluene. Declining demand since the end of the Korean war was reflected for the first time last year with a 9 per cent reduction in output.

The petroleum industry is bolstering its position in these three basic aromatics each year. In benzene, for example, over 33 per cent of total output representing 111,613,000 gal. came from petroleum. Coke-oven operators still produce most of this specification and industrial grade benzene. But as recently as 1949, the nation's catalytic reformers produced none.

Nominal inroads into the toluene field have continued since World War II, when petroleum toluene first made its appearance.

The following table shows the percentage of total U. S. output of the three basic aromatic chemicals which was produced by oil refiners:

	Benzene	Toluene	Xylenes
1956	33.1	75.4	91.0
1955	32.0	77.2	89.2
1954	35.7	77.0	90.4
1953	23.1	73.8	90.6
1952	14.1	60.7	85.9
1951	12.3	55.0	85.0
1950	5.4	54.1	87.0
1949	0.0	58.7	86.0



Barge lays 16-in. line from mainland . .

. . to seven-well platform off Louisiana.

Transco to Finish Offshore Gas Line by Fall

OFFSHORE CREWS will finish work this fall on Transcontinental Gas Pipe Line Corp.'s line tapping the Block 45 gas field in Louisiana's West Cameron area.

The 16-in. line is being built by Sharman, Allen, Gay & Taylor, Inc., Houston contractors. It consists of a 7½-mile underwater link and 21 additional miles through the Louisiana marshlands.

The contractors are using conventional offshore pipelaying procedures in connecting the mainland with the seven-well platform of Mecom Petroleums and San Jacinto Petroleum Corp. (see photos). The lay barge contains an inclined pipe-laying production line.

Transco has contracted to pay 16 cents per M.c.f. for a gas flow of 30 million cubic feet daily initially and 50 million after a year. A total of 88 billion cubic feet is committed to Transco.

Construction also is under way on Tennessee Gas Transmission Co.'s offshore pipeline in the West and East Cameron areas. The facilities will tie in offshore reserves of the C.A.T.C. group with T.G.T.'s pipeline system running to eastern states.

Brown & Root, Inc., is building the T.G.T. line, which will move up to 6 trillion cubic feet of gas under contracts now in force. The line should be completed this fall, when T.G.T. will take up to 175 million cubic feet daily the first year.

Some say it's commercial but . . .

Washington Well Still "Tight"

SEATTLE.—Sunshine Mining Co.'s highly touted wildcat in the Ocean City area of Gray's Harbor County, is now considered Washington's first commercial oil discovery.

Sunshine is not releasing any information on the well until August 20, but major oil-company scouts in the area report the well, 1 Mediana, flowed 275 bbl. daily of clean 48°-gravity crude on a 24-hour production test August 2.

The reason for the August 20 deadline on company-released information, according to a Sunshine spokesman, is to give Sunshine time to round up additional acreage.

The company applied for 3 offset locations to the discovery August 6 and expects to spud in on one "very soon." Neither the company nor the Washington oil and gas supervisor would release exact location information on the offsets.

While a "tight hole" as far as company-released information is concerned, scouts report pipe has been set to 4,133 ft. in the 4,135-ft. total-depth hole. Another report said the well blew out in 6 minutes on a drill-stem test of an interval at 4,064-89 ft.

The area has been the scene of drilling before. Union Oil Co. completed two wells there in 1950 and '51, but abandoned both a short time later when production rapidly dipped below commercial rates. Sunshine's discovery is a northerly offset to one Union test and a northwest offset to the other.

In $25-million stock exchange:

Halliburton Acquiring Welex

DUNCAN, Okla.—Halliburton Oil Well Cementing Co. has arranged to acquire Welex Jet Services, Inc., Fort Worth, to form a new Halliburton subsidiary.

Through an exchange of stock, Halliburton plans to merge its electrical well services division with the Fort Worth company. The new firm will be called Welex, Inc.

One share of Halliburton common stock will be exchanged for 2.4 shares of Welex Jet stock. Since Welex Jet has about 863,000 shares outstanding, the purchase will involve about 360,000 shares of Halliburton stock.

At the current market price for Halliburton stock, the transaction would amount to more than $25 million. When the deal is closed, Welex Jet will be dissolved.

Both boards of directors have approved the merger. Final approval must come from Welex Jet stockholders. This is expected within 2 or 3 months.

What it means . . . L. B. Meaders, Halliburton president, said that adding the Welex jet-perforating facilities to Halliburton's well-logging department will mean a much broader line of wire-line services for Halliburton.

Ray O. Shaffer, Welex Jet president, will head the new Halliburton subsidiary. Headquarters will be in Fort Worth. The research center will be in Houston. All present employes of both Welex Jet and Halliburton's wire-line division will be retained.

In areas where both Welex Jet and Halliburton operate, facilities will be combined. These include the Mid-Continent area, the Rocky Mountains, Gulf Coast, and Canada. Halliburton's present wire-line territory also includes California and the tri-state area of Illinois, Indiana, and Kentucky.

Besides its wire-line services, Halliburton specialties include oil-well cementing, fracturing, and acidizing. Welex specialties include jet perforating, radioactivity logging, and cementing.

Leasing Pact Made

Feud settled by Interior, Navy over offshore parcel

WASHINGTON. — A long-range timetable has been set up for leasing of a disputed section of federal lands in the outer Continental Shelf.

The compromise plan was worked out between the Interior and Defense departments, but is subject to approval of the President.

Involved is Navy's W-92 aerial gunnery range, an area which now covers 1,500 sq. miles but which would be enlarged to 6,135 sq. miles. Here's the way the deal works:

Navy gets a bigger chunk of land at the start, but Interior later cuts into the withdrawal on a stepping-stone basis.

The new northern boundary of W-92 would be latitude 28° 31' 00" N, about 100 miles seaward of New Orleans. The southern boundary would reach as far south af 26° 50' 00" N.

Interior has agreed to issue no leases inside the area until July 1, 1958, without Navy's approval. After this date, Interior could issue leases in a strip 18.3 miles wide and running across the top of the gunnery range. Southern edge of the strip would be latitude 28° 15' 00" N. Interior would issue no leases below that line until July 1, 1961.

The strip to open up in 1958 cuts across water ranging in depths from 96 ft. to 288 ft. No wells today are producing in water deeper than 125 ft., but equipment is being built for work in deeper water.

Idled Plants Open

Supervisors running one, strike settled at other

TWO STRIKEBOUND refineries are operating again—one with supervisory personnel at the controls and no sign of an agreement in sight.

At Pasadena, Tex., Crown Central Petroleum Corp. signed a new contract with workers at its 35,000-bbl. plant. But at Lima, Ohio, Standard Oil Co. (Ohio) appeared bogged down deeper than ever in its negotiations.

Lima supervisors went back into the 50,000-bbl. plant after the company charged that the Oil, Chemical, and Atomic Workers International Union reverted back to its original demands of June 7, starting date of the strike.

Seward Bolles, plant manager, said some of the striking refinery workers had asked that the plant be reopened. The workers were invited to go back on the job with a 6 per cent increase in wages, an eighth paid holiday, and 4 weeks vacation after 20 years of employment.

Sohio has an $856,000 damage suit pending against the union (OGJ, July 15, p. 69). Four other Sohio plants are down because of O.C.A.W. strikes, two in Cleveland and one at Covington, Ky., and one at Toledo. Sohio said it has no immediate plans for starting up any of the others.

Crown Central's offer, covering virtually the same benefits as those offered at Lima, was accepted after 90 days. The strike started May 9. Bargaining agent at Crown Central is also the O.C.A.W. Demands had centered around increased staffing on certain jobs. The company said some job classifications were revised, but that no additional personnel would be required.

Merger OK Asked

El Paso asks FPC approval of Pacific Northwest deal

WASHINGTON.—El Paso Natural Gas Co. last week asked the Federal Power Commission to approve its merger with Pacific Northwest Pipeline Corp.

The formal application was filed 2½ weeks after the Department of Justice filed suit in the U. S. District Court at Salt Lake City to undo El Paso's purchase of Pacific Northwest.

Paul Kayser, El Paso president, said he is confident FPC "will find the proposed merger is in the public interest."

Kayser said: "By filing the merger application, the entire question of public interest connected with the integrated operations of the two pipeline systems can be examined by FPC."

Kayser said El Paso's acquisition of Pacific early this year does not come under jurisdiction of FPC.

The stock-purchase route was used, rather than outright merger, to make sure there was no interruption of service during "lengthy FPC hearings," Kayser said.

Some observers were inclined to believe that El Paso would be on a stronger footing in the courts if it gets FPC approval of the marriage of the two largest gas companies in the west.

The Justice Department action is under a section of the Clayton Antitrust Act, which forbids certain mergers by stock purchase if they tend to have a harmful effect on competition.

Ohio Awards Products Job

FINDLAY, Ohio.—Ohio Oil Co. let contracts last week for the first leg of its 350-mile, 12-in. products system from Wood River and Robinson, Ill., to Chicago.

Panama-Williams Corp., Houston, will build the 84-mile leg from Ohio's 40,000-bbl. daily Robinson refinery to Champaign, Ill.

The Robinson leg of the 12-in. will connect with Ohio's 10-in. line from Wood River to Claimont, Ind., about 20 miles north of Robinson. The new line from Wood River to Chicago will be built next year. The system will give Mid-Continent refiners a new outlet into the Chicago market. It also will alleviate the barge bottleneck through the Alton, Ill., locks during low-water periods on the Mississippi and Illinois rivers. Ultimate capacity will be 90,000 to 100,000 bbl. daily (OGJ, November 26, 1956, p. 49).

Processing briefs

Standard Oil Co. (Ind.) has let contract to Foster Wheeler Corp. for a 1,630-bbl. HF alkylation unit at its Mandan, N. D., refinery. The unit, licensed by Phillips Petroleum Co., will alkylate a combined propylene-butylene refinery feed with isobutane, supplemented by pipeline with purchases from Signal Oil & Gas Co.'s Tioga natural-gasoline plant 160 miles away.

Product will be blended to high-octane gasoline for distribution in the Montana-Dakota-Minnesota market. Completion is scheduled for September 1958.

Cities Service Oil Co. (Pa.) will build a modern asphalt plant at Linden, N. J., to replace its existing refinery there. Initial capacity will be 14,000 bbl. daily. Output will be nearly 11,000 bbl. of straightrun and oxidized asphalts for paving, roofing, and industrial uses.

The plants will include atmospheric and vacuum distillation, electric desalting, oxidizers, a cutback blending system and a new boiler plant. It will charge heavy Venezuelan and Mexican crudes now being processed. When the new plant is finished, existing facilities for handling about 14,000 bbl. of crude will be shut down. Minor modification will permit expansion of the new plant about 25 per cent.

Columbia Gas System, Inc., of New York is going into the production of raw materials for petrochemicals. It will build an $8,000,000 hydrocarbon extraction plant at Kenova, W. Va., and a $5,000,000 hydrocarbon fractionation plant at Siloam, Ky.

The extraction plant, to recover heavier hydrocarbons from 170,000,000 ft. of natural gas per day, will be operated by United Fuel Gas Co., a subsidiary with headquarters in Charleston. The two plants will be connected by a pipeline to move liquid hydrocarbons. Completion date has been set for December 1958. J. F. Pritchard & Co. of Kansas City has the contract.

Colorado Oil & Gas Corp. of Denver has acquired outlets which will permit Derby Refining Co., a wholly owned subsidiary, to produce at its new capacity of 20,000 bbl. daily.

The company bought Deem Oil Co. of East St. Louis and affiliated companies, including 59 owned or leased service stations in St. Louis and Jefferson City and adjacent areas of Missouri and Illinois. The Deem stations sold 47,000,000 gal. of gasoline and burning oils last year.

Leonard Refineries, Inc., is starting a multimillion-dollar expansion at Alma, Mich. Main items are a 7,500-bbl. fluid catalytic cracking unit and a 43-mile pipe line to a new Lansing terminal. Ralph M. Parsons Co. has the contract to build the cat cracker.

Continental Oil Co. has completed a $1,400,000 modernization project at its 11,000-bbl. Denver refinery. The project includes a new 3,300-bbl. catalytic reforming unit.

A new record for Esso Standard Oil Co., or any of its affiliates, was set recently when the Model III fluid catalytic cracking unit at Bayway refinery processed over 100,000 bbl. of feed stock per day. The unit, built in 1949, had an initial capacity of 43,200 bbl. per day. Seven years later, it was almost doubled in capacity. Although still rated at 82,700 bbl. per day of total feed, the unit has steadily improved its throughput until the 100,000-bbl. daily was exceeded.

Also for Refiners . . .

Sun's defiance of the Government's imports order is one of several developments growing out of importers' reaction to the order (p. 71) . . . The 1956 Tariff Commission report shows ethylene is still the nation's fastest growing basic petrochemical (p. 76) . . . Two strikebound refineries—Crown Central's Pasadena, Tex., plant and Sohio's Lima plant—are back on stream (p. 78) . . . O.C.A.W. says it costs almost $409 to recruit a new member (p. 83) . . . ENAP will expand its refinery at Concon, Chile (p. 91) . . .

PLUS THESE TECHNICAL FEATURES: Modification of alkylation unit increases throughput for El Paso (p. 94) . . . Gulfining units exceed design capacity (p. 99) . . . New absorption system gives high ethane recovery (p. 104) . . . Foreman's Page (p. 127) . . . Field Processing (p. 129) . . . and Questions on Technology (p. 131).

L.A.C.T. Wins OK

Texas grants Shell first permit for permanent unit

AUSTIN.—The first permanent automatic - custody - transfer system in Texas is now a reality.

The Texas Railroad Commission last week approved Shell Oil Co.'s installation on its Hugh Henderson lease in Antelope field of Clay County, North Texas, as a permanent facility.

The commission for the past year had permitted the unit to operate under temporary 6-month permits. The L.A.C.T. unit's operation was reviewed for the commission on expiration of each permit. The commissioners visited and inspected the unit last March.

Shell told the commission in applying for a permanent permit that it had made no changes in the unit's operation since the last review. All oil has been transferred automatically to the pipeline since October 1, 1956. And the battery, Shell says, has successfully transferred 108,708 bbl. of oil in 635 tank runs since that time.

Since last changes were made, the unit measured 44,681 bbl. of oil from February through May of this year with an error of only 1.56 bbl., Shell said.

Wants others . . . Obviously pleased with its L.A.C.T. unit performance, Shell has asked the commission to approve similar installations for five of its leases in big Mineral Creek field of Grayson County.

A Shell engineer, W. J. Fairbanks, told the commission the proposed units would have the same five checks against measuring accuracy and also the same failure-safe features.

Fairbanks said the L.A.C.T. operation in Antelope field has borne out Shell's contentions that such crude handling conserves reserves, cuts capital costs (income from salvaging oil tanks and allied equipment on the leases will more than pay for the new units), and operating costs (Shell anticipates labor savings of $300 for pumpers alone). The transporter also stands to gain since that system cuts duties of its gagers, Fairbanks said.

New Company Plans Line

CHEYENNE, Wyo.—The newly-formed Belle Fourche Pipeline Co. of Casper plans to build a 30-mile 6-in. crude-oil pipeline from Donkey Creek pool to Fiddler Creek pool in northeastern Wyoming.

The line will connect with Plains Pipeline Co. at Fiddler field and will cost about $700,000. Plains will build a new $100,000 pumping station, tankage, and lines to handle the connection.

Belle Fourche will later build another line from Fiddler Creek to connect with Butte Pipe Line Co. near Osage, Wyo. Wyoming Public Service Commission had originally granted a similar permit to R. H. Fulton & Co., but transferred the permit to Belle Fourche.

Belle Fourche was recently formed by H. A. True, Jr., Harvey J. Lander, Margaret A. Kobel, Dixie Lam, and Houston G. Williams, all of Casper.

Suit Hits Hughes

Tool company charged in restraint-of-trade case

HOUSTON. — "We don't know what the heck we're even charged with yet, but our attorneys feel very strongly that we have not violated any United States laws."

That's the way M. E. Montrose, vice president of Hughes Tool Co., described antitrust charges filed against Hughes by the Justice Department. Montrose said the company's attorneys have not had an opportunity to fully study the complaint.

In a suit filed in New York federal court, the Justice Department charged Hughes with violation of the Sherman Act since about 1950 in a conspiracy with the German firm of Maschinene-und Bohrgeratefabrik Alfred Wirth & Co.

The two companies allegedly agreed on minimum prices the German firm would charge for certain drilling-equipment items. The suit also charges that Wirth would not produce or sell the equipment without Hughes' approval and that it would not produce equipment for sale or use in the Western Hemisphere.

It was further alleged that the two companies would pool their patents, present and future, on tool joints and rock bits.

Strikers Tie Up Drilling

LOS ANGELES. — Drilling has been halted on Monterey Oil Co.'s earth-filled island off Seal Beach by a strike against Brown Marine Drilling Co.

The drilling contractor's employes are asking that the Operating Engineers Union be recognized as their bargaining agent. A picket line has been set up as close to the island as possible—at the end of the Seal Beach pier.

About the same time the drillers walked off the job, the water-taxi company which ferried the men to the job also called a strike against Brown Marine and formed another picket line.

Monterey was drilling below 1,160 ft. on 25 Monterey-Texas-State when the rig was idled by the walkout.

Westcoast Deal Set

Pacific Petroleums sells Peace River gas company

CALGARY.—An exchange of stock between two Canadian companies will make Pacific Petroleums, Ltd., number one stockholder of Westcoast Transmission Co., Ltd.

Pacific's subsidiary, Peace River Natural Gas Co., Ltd., has agreed to sell its assets to Westcoast. Since Pacific already holds about 21 per cent of Westcoast's stock, the exchange will make Pacific largest stockholder in the company.

Until this recent shift in stocks, largest stockholder in Westcoast was El Paso Natural Gas Co., with about 25 per cent ownership of Westcoast.

The deal between Westcoast and Peace River would involve exchange of one share of Westcoast for three shares of Peace River stock. The transaction must first be ratified by Peace River stockholders.

Westcoast, which is nearing completion of a 650-mile, 30-in. natural-gas line from Canada's Peace River area to Sumas, Wash., will become more integrated as a result of the exchange.

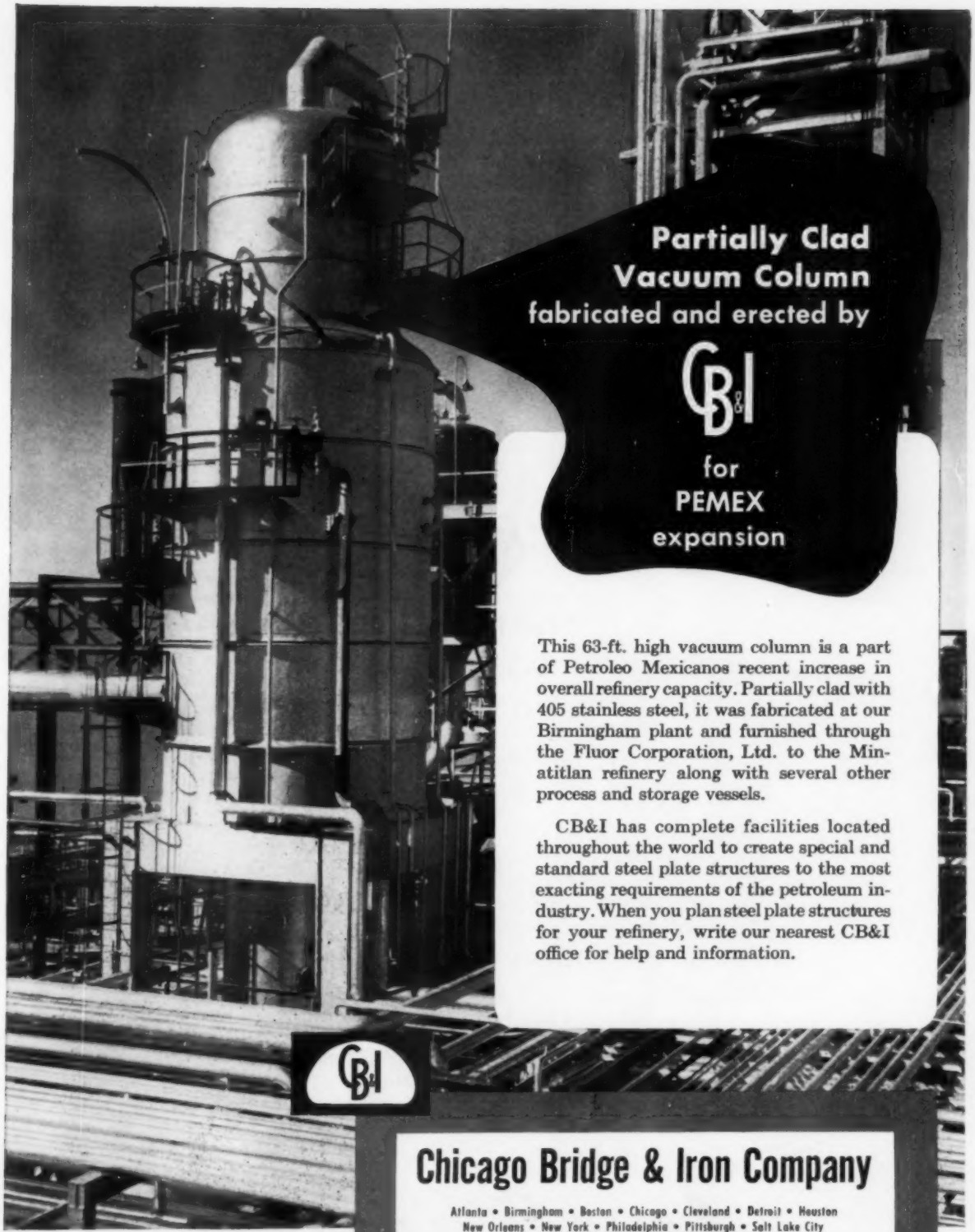
Peace River Natural Gas Co. has interest in about 2,400,000 acres in British Columbia and Alberta. Some of this acreage contains natural-gas reserves which will be tapped by Westcoast when the pipeline is completed this month.

Shale Competition Closer

DENVER.—The price gap between shale oil and petroleum may be closed within 5 years, according to Shirley A. Johnson, director of the Denver Research Institute.

Johnson points out that the minimum wholesale cost of shale oil delivered in Los Angeles is 15 cents a gallon, compared to 13½ cents for petroleum.

"The 1½-cent differential is not much," Johnson says. "The cost of finding petroleum is going up, and that of shale will never go up for it is already found. Sometime the prices will meet, and I think within the next 5 years."



Partially Clad Vacuum Column fabricated and erected by CB&I for PEMEX expansion

This 63-ft. high vacuum column is a part of Petroleo Mexicanos recent increase in overall refinery capacity. Partially clad with 405 stainless steel, it was fabricated at our Birmingham plant and furnished through the Fluor Corporation, Ltd. to the Minatitlan refinery along with several other process and storage vessels.

CB&I has complete facilities located throughout the world to create special and standard steel plate structures to the most exacting requirements of the petroleum industry. When you plan steel plate structures for your refinery, write our nearest CB&I office for help and information.

Above: 63-ft. high vacuum column partially clad with 405 stainless steel built by CB&I for Petroleo Mexicanos Minatitlan refinery.

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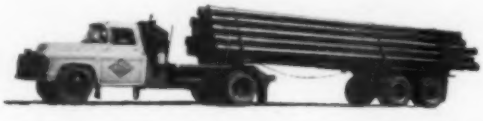

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Prosperity is no help:

Union Finds Organizing Tough

CHICAGO. — Organized labor is feeling the "pinch" of prosperity. High wages are making it harder to enlist new union members.

During the fiscal year ended May 31 the Oil, Chemical and Atomic Workers International Union spent $574,455 to add 1,405 members—nearly $409 each.

"Organizing is heart-breakingly expensive because organizing does not come easy in these times of prosperity," President O. A. Knight told the O.C.A.W. annual convention here last week.

"Either the unions must face up to this fact," he declared, "or we will continue to organize on only a small, limited scale."

Knight favors a big drive for new members. It's needed, he told the delegates, because O.C.A.W. is far from the strength needed "to make us fully effective at the bargaining table."

More money will be needed, he said, but he refrained from endorsing a convention proposal to raise dues $1 per month.

Why the problem . . . Elwood D. Swisher, O.C.A.W. vice president, said plant shutdowns and force reductions took away members almost as fast as they were recruited in new plants.

"These reasons, plus normal turnover in plants caused 30,442 members to leave the union during the year. The union's efforts in organizing new groups, plus the close-the-ranks programs in old groups, replaced these 30,442, plus 1,405 more."

He said small units are easier to organize than large ones.

In small units of fewer than 100 persons, O.C.A.W. won out in 88 out of 121 cases during the last fiscal year.

In large units of more than 100 persons, the union won only 11 out of 33.

Automation . . . Knight isn't worried about the rapid strides in automation.

"Given continued prosperity and continued wage increase," he said, "automation should not cause general unemployment. Instead, there should be a greater flow of products for people to enjoy and shorter hours of work."

But he told delegates to be on guard against injustices to the individuals who are displaced by new equipment.

Knight called for more attention to the increasing need for highly skilled workers and technicians and the decreasing need for unskilled and semi-skilled workers.

Along this line, he encouraged on-the-job training programs, with union cooperation.

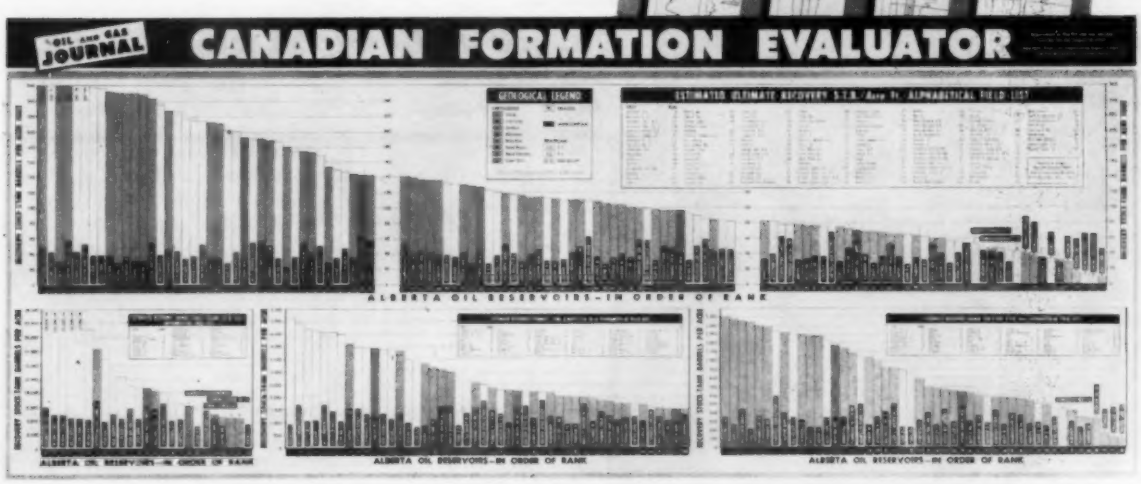
Next week:

CANADA—Oil & Gas Unlimited

THE JOURNAL'S annual Canadian issue comes out August 19. It spreads an observation canopy over the empire of oil and gas that has sprung from the plains and mountains of western Canada.

Fresh, exclusive articles—based on today and pointed at tomorrow—will paint a picture of progress for Canada's oil industry.

And an extra! The four-color wall charts pictured here will give Journal readers a fingertip reference to reserves and reservoirs in Canada.



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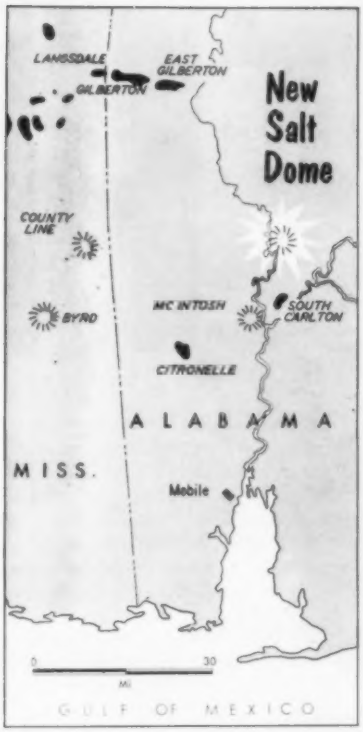

New Dome Found

Humble dry hole uncovers Alabama's second salt dome

MOBILE, Ala.—A deep wildcat 55 miles northeast of here in southern Clarke County has found Alabama's second salt dome.

The discovery is 20 miles northeast of the state's only other known dome, McIntosh, in southern Washington County. This makes it the most easterly known dome in the entire Gulf Coast region.

The new Alabama discovery was made by Humble Oil & Refining Co. with its 1 Champion-Klepac, which was abandoned last week as a dry hole at 15,300 ft. after penetrating 4,124 ft. of salt.

This dome differs from the McIntosh dome in that it is a deeply seated, nonpiercement salt mass. McIntosh is a shallow, piercement dome with top of the salt at 410 ft.

Alabama's two known domes are at the eastern extremity of the Louisiana-Mississippi Interior basin (Mississippi embayment), south of the Jackson fault. They are typical of others found in southern Mississippi and northeastern Louisiana.

Although few of these interior domes, unlike those of the Texas-Louisiana coastal area, have been found commercially productive of oil or gas so far, all are looked upon as potentially productive some time.

Pipeline briefs

Interprovincial Pipe Line Co. the first half of 1957 increased crude deliveries 10 per cent above the same period last year. Crude oil delivered totaled 50,300,000 bbl. Interprovincial now stretches from Edmonton to Sarnia, Ont., and is being extended 156 miles eastward to Port Credit, in the Toronto area. The extension is part of a $26-million expansion program.

Texas Illinois Natural Gas Pipeline Co. has awarded contracts for 44 miles of 36-in. and 4 miles of 34-in. loop line to Midwestern Constructors, Inc., Tulsa. The loop extends from south of Joliet paralleling Texas Illinois' Volo line to Howard Street, west of Chicago. The project will start September 20. Completion depends on pipe delivery.

Salt Lake Pipe Line Co. has started a looping program to increase deliveries of crude and products by December 1.

Engineers Limited Pipeline Co. of San Francisco is laying 93 miles of 10-in. between Rangely field and Salt Lake City. This loop, plus increased horsepower, will boost crude capacity by 14,000 bbl. to 70,000 bbl. daily.

Hallmac Construction Co. of Houston has the contract for 80 miles of 8-in. from Ontario to Adams, Ore., on the Salt Lake-Spokane products line. Pipe has been laid on a 20-mile section between Ontario and Huntington and work is proceeding between Powder, Ore., and Adams. Capacity will be increased 5,000 bbl., bringing the total to 30,000 bbl. daily, on the Boise-to-Pasco section. New pumping facilities will boost capacity 10,000 bbl. to 56,000 bbl. daily from Salt Lake City.

Houston Contracting Co. will start laying pipe around August 15 on its third 30-in. spread for Texas Eastern Transmission Corp. between Kosciusko, Miss., and Uniontown, Pa. The spread just starting is 80 miles from Kosciusko to Egypt, Miss. This is part of a 1,000-mile, 30-in. program which Texas Eastern is carrying out this year to add new capacity and replace capacity lost in converting the Little Big Inch from gas to products.

Revenues of the gas-utility and pipeline industry hit $5,957 million for the year ending March 31, a gain of $468 million or 8.5 per cent. Natural-gas sales, as usual, led the way, advancing 8.2 per cent to 70,859 million therms. This was more than 96 per cent of total sales. Natural gas also added 2.4 million customers during the year, bringing the total to 26.7 million.

First-quarter sales for this year also ran high for natural gas—23,052 million therms, up 4.8 per cent. This brought in $1,291 million, a gain of 9.4 per cent. The gas industry overall registered sales of $1,406 million during the first quarter of 1957.

Plans to construct about 61 miles of natural-gas pipeline in Wyoming have been announced by Northern Utilities Co.

The company proposes 35 miles of 16-in. line in the Fremont-Natrona County area, 8¼ miles of 12-in. around Casper, 6 miles of 8-in. from the Sand Draw gas field to the Beaver Creek field, and 12 miles of 6-in. from the Beaver Creek field to the pipeline system serving the Riverton-Lander area. The new pipelines, together with a new compressor at Casper, will cost $2 million.

Also for Pipeliners . . .

Small-diameter line pipe along with all other oil-country tubular goods is going begging as companies cut inventories (p. 67) . . . Pipeline-patrol pilots are spotting leaks with powder "bombs" (p. 70) . . . Transco is putting finishing touches on its 16-in. line that will tap a gas field off Louisiana (p. 77) . . . El Paso hopes to get the FPC's approval of its plans to merge with Pacific Northwest (p. 79) . . . A new company, Belle Fourche Pipeline Co., plans a crude line in Wyoming (p. 80) . . . Pacific Petroleums is slated to become Westcoast Transmission's biggest shareholder (p. 80) . . . Mene Grande is adding new lines in Venezuela (p. 91) . . . Argentina signs $115-million pipeline deal with Americans and Europeans (p. 93).

PLUS THESE TECHNICAL FEATURES: Emergency shutdown system safeguards compressor station by remote control (p. 96) . . . and Pipeline Patrol describes Atlantic Pipe Line Co.'s new microwave system (p. 139).

A FLOATING ROOF IS ONLY AS SAFE AS ITS SEAL

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SAFER BECAUSE the design of the seal virtually eliminates critical vapor space—prevents collection of explosive air-vapor mixture, even in the broad range of jet fuels.

SAFER BECAUSE even in exposure fires if fabric is damaged, there is an all-steel, fire-retardant seal. In exposure fires, all-fabric seals burn out quickly, leaving no seal at all.

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SAFER BECAUSE the possibility of fire originating within the seal is reduced almost to zero. Even when the air-vapor mixture is test-ignited, pressure during burning is held to atmospheric. Fabric *instantly* flexes upward—expanding 300% to 500%—containing the products of combustion without damage to the fabric.

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WIGGINS SAFETY SEAL

Middle East Output Up

Free-world production hits record as result of Persian Gulf gains; Venezuelan flow nears 3,000,000 bbl. daily

GAINS in the Persian Gulf area raised total free-world crude production in May to an all-time high of 15,869,200 bbl. daily.

This was a world-wide increase of 360,900 bbl. daily, a 2.3 per cent gain in 1 month. It also was the fourth record month in a row.

The Middle East produced 3,546,100 bbl. daily, up 406,100 bbl. daily. This level was 91.5 per cent of the area's record October 1956 output, before the Suez Canal and Iraq-Mediterranean pipelines closed.

At the same time, most other major producing areas in May held on to or slightly increased gains made during the crucial winter months. The exception was the United States. Output fell for the second month, off 99,000 bbl. daily to 7,442,000 bbl.

The reopening of the Suez Canal to large-scale shipping was the key to the Middle East comeback. It also resulted in the first reduction in bulk product prices in the Caribbean and along the East Coast since October.

The price cut occurred when European crude buyers switched back to the Middle East from Western Hemisphere markets. This caused a lag in demand for Western Hemisphere products and a drop in tanker rates. Seasonal factors were also involved.

In the long-range picture, May saw other free-world areas take a big step in the trend toward outdistancing U. S. production. The U. S. had trailed other free-world areas by 1,285,800 bbl. daily in October. For the next 5 months, the U. S. resumed its traditional role of out-producing the total of all other areas.

In April, U. S. output again lagged by 426,300 bbl. daily. In May, it trailed by 985,200 bbl. daily.

TREND OVER LAST YEAR

	Western Hemisphere less U.S.	Middle East	Total, non-Communist countries
1956—			
May	3,341.8	3,790.3	7,790.3
June	3,519.1	3,713.7	7,871.7
July	3,549.8	3,806.1	7,996.6
August	3,618.2	3,685.8	7,965.6
September	3,637.2	3,721.8	8,019.3
October	3,688.3	3,873.5	8,251.8
November	3,760.8	2,142.8	6,544.2
December	3,915.9	2,428.9	6,989.7
1957—			
January	3,993.9	2,645.7	7,301.7
February	4,040.7	2,855.5	7,561.6
March	4,117.8	2,764.3	7,582.0
April	4,093.8	3,140.0	7,967.3
May	4,142.4	3,546.1	8,427.2

A World-Wide Look at Crude Production

(Daily average in thousands of barrels)

Country—	May 1957	April 1957	May 1956
Western Hemisphere:			
Argentina	88.4	88.4	85.4
Bolivia	9.5	9.6	8.5
Brazil	22.0	20.2	6.5
Canada	535.0	508.3	387.4
Chile	11.2	11.1	9.3
Colombia	124.5	127.3	118.9
Cuba	1.1	1.0	1.6
Ecuador	7.7	7.8	9.5
Mexico	260.0	255.0	239.5
Peru	52.8	52.8	48.8
Trinidad	93.2	91.1	77.5
Venezuela	2,937.0	2,921.2	2,348.6
Total	4,142.4	4,093.8	3,341.5
W. Europe & Africa:			
Algeria	0.3	0.3	0.7
F. Morocco	1.6	1.6	2.2
Egypt	44.0	44.8	39.3
Austria	63.5	63.5	64.7
France	28.8	28.5	22.8
W. Germany	75.8	75.2	67.8
Italy	23.4	24.8	10.6
Netherlands	28.3	26.8	20.6
Turkey	6.5	6.5	6.0
United King.	1.6	1.6	1.5
Yugoslavia	7.6	7.7	5.5
Total	281.4	281.3	241.7
Middle East:			
Bahrain	30.1	30.1	30.1
Iran*	701.0	676.0	560.0
Iraq†	418.3	419.1	716.5
Israel	1.4	1.4	0.6
Kuwait	1,121.0	948.0	1,207.0
Neutral Zone	50.0	40.0	25.1
Qatar	125.0	107.0	129.7
Saudi Arabia	1,099.3	918.4	1,121.3
Total	3,546.1	3,140.0	3,790.3
Other Asia:			
British Borneo	120.0	120.0	119.4
Burma	5.0	5.0	4.9
India	9.2	9.2	7.5
Indonesia	305.0	300.0	366.4
Japan	5.8	5.7	6.0
New Guinea	6.4	6.4	6.7
Pakistan	5.9	5.9	5.6
Total	457.3	452.2	416.5
Free World:			
Foreign	8,427.2	7,967.3	7,790.0
United States	7,442.0	7,541.0	7,064.0
Total	15,869.2	15,508.3	14,854.0
Communist countries in Soviet orbit:			
Romania	220.0	220.0	200.0
Russia	1,885.0	1,885.0	1,600.0
Others	50.0	50.0	50.0
Total	2,155.0	2,155.0	1,850.0
World total	18,024.2	17,663.3	16,704.0

*Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies.

†Includes estimated 5,000 bbl. daily from Naft Khaneh field, operated by British Petroleum Co.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which includes the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made for those countries, particularly in Southeast Asia, where complete reports are lacking.

Kuwait, Saudi Arabia . . . Leaders in the Persian Gulf area were Kuwait and Saudi Arabia. Both passed the 1,000,000-bbl. daily mark for the first time this year.

Kuwait added 173,000 bbl. daily for a total of 1,121,000 bbl. daily. The Saudi Arabia gain was larger, up 180,700 bbl. daily, to push total production to 1,099,300 bbl. daily.

Iranian fields produced 701,000 bbl. daily, up 25,000 bbl. daily. Iraq slipped back 800 bbl. daily to 418,300 bbl. daily. But Qatar, where output also is handled by the Iraq Petroleum Co., Ltd., group, gained 18,000 bbl. daily for a total of 125,000 bbl.

Venezuela . . . Output in Venezuela gained 15,800 bbl. daily, for a total of 2,937,000 bbl. daily, the tenth record month in a year. This level raised the 5-month average to 2,885,300 bbl. daily.

The chief producers were Creole Petroleum Corp., 1,264,800 bbl. daily; Cia. Shell de Venezuela, 918,600 bbl. daily; Mene Grande Oil Co., 418,700 bbl. daily; Socony Mobil Oil Co., Inc., 113,600 bbl. daily; and Richmond Exploration Co., 92,700 bbl.

Creole, the largest producer, obtained 1,045,500 bbl. daily from its Lake Maracaibo wells. Other western Venezuela production accounted for another 5,800 bbl. daily. Eastern Venezuela output came to 110,200 bbl. daily. The balance of Creole's crude consisted of purchased royalty oil.

Ethyl Research Performance of Today's

by T. W. Warren

Director, Refinery Technology, Ethyl Corporation Research Laboratories

A premium fuel being road tested in one of Ethyl's controlled-weather rooms that duplicates road conditions exactly.

Reports on Premium Fuels

NINETY-ONE premium gasolines and 12 third-grade super-premium fuels have been tested on the road and in the laboratory in a research program recently completed by Ethyl's Detroit Research Laboratories.

The results of this investigation have been published in a 140-page report entitled "Antiknock Behavior of Premium Motor Fuels, 1957", now available to all companies in the Oil and Automotive Industries.

The fuels tested were submitted by 83 refineries of 48 American companies. These refineries produce 75 per cent of the motor fuel in the United States. Seven Canadian companies, producing an appreciable percentage of Canada's gasoline needs, also submitted fuel samples for testing.

Each Gasoline Tested 32 Times

Five 1957 cars normally requiring premium fuels, and three cars equipped with experimental 11 to 1 compression-ratio engines were used in the tests. A minimum of two Modified Uniontown and two Modified Borderline ratings were obtained for each gasoline in each car, a total of at least 32 road ratings for each fuel sample.

Extensive laboratory data, including determinations of tetraethyllead susceptibility, hydrocarbon type, and bromine number, were also obtained and are included in the report.

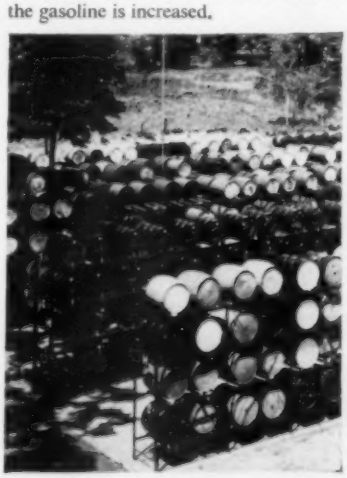
Test Results Point to Future Gasoline Developments

The broad sampling of premium fuels tested gave an accurate picture of today's premium gasolines and how they perform in the cars of today and in the higher compression engines of tomorrow. A complete analysis of all the test data led to the following conclusions affecting refining economics:

1. Sensitivity (the difference between Research and Motor octane number) often is an unreliable measure of road performance through the normal speed range.

2. Research and Motor octane numbers can be used to predict road performance at low speeds but are less reliable at intermediate and high speeds.

3. At higher speeds, road performance increases when the aromatic content of the gasoline is increased.



The 103 premium and super-premium gasolines in these drums were tested for Ethyl Corporation's 1957 premium fuel survey. This is the fifth premium survey conducted by Ethyl since 1946.

An important by-product of this program was the development of a system for calculating the road octane number of a gasoline. This development will permit individual refiners to determine the "road octane number" of their gasoline blends using the results of simple laboratory tests.

How Ethyl Research is helping you

Since World War II, Ethyl Corporation has investigated the laboratory and road performance of premium-grade gasolines in 1946, 1949, 1951 and 1954. During this period, the number of fuels analyzed has increased from 12 gasolines in 1946, to 63 in 1954 and 103 in 1957.

"Antiknock Behavior of Premium Motor Fuels, 1957" is one more example of Ethyl's continuing service to the Oil Industry. Copies can be obtained from your Ethyl Representative or by writing Ethyl Corporation, 100 Park Avenue, New York 17, N. Y.

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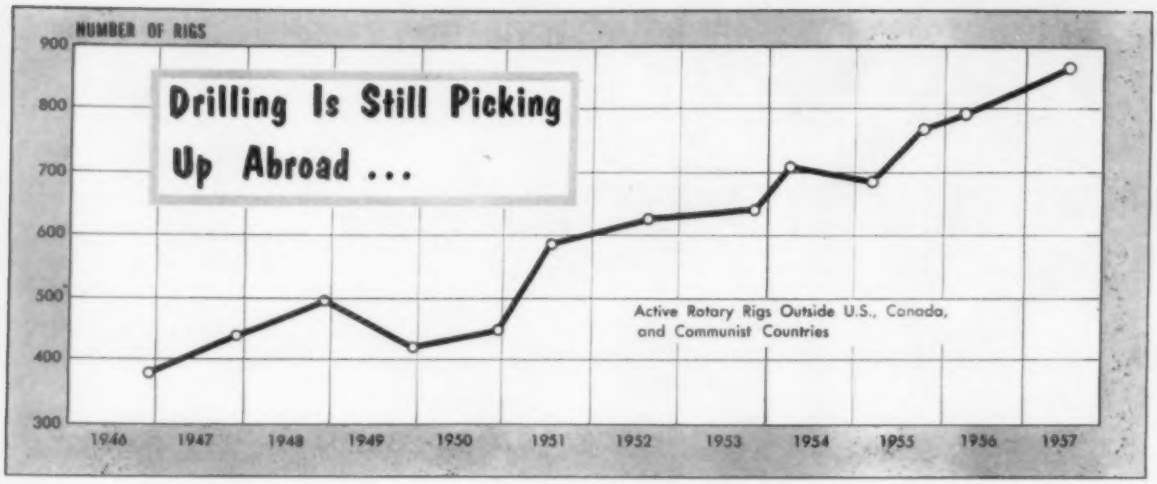


Foreign Rig Activity Hits a New Peak

FOREIGN rotary rigs are busier than ever, in spite of the slump in drilling activity in the U. S.

The Journal's survey shows a record 861 rigs running this summer in the free world outside the United States and Canada. These include rotaries used in exploration, development, workovers, and servicing.

The new record is a 9 per cent increase over March 1956 and continues the upward trend which has been going on since 1949.

In contrast, summer activity in the U. S. reflects the drilling slump which began last winter. During July active rotaries in the U. S. averaged 2,525—nearly 100 fewer than last July's 2,622. In Canada 208 rotaries were running — 37 fewer than a year earlier.

There's little connection abroad between the number of rigs running and the level of crude-oil production.

For example, in West Germany where production averages about 75,000 bbl. daily, 138 rotary rigs are running.

This is more than six times the combined number of rigs working in the four leading Persian Gulf producing countries of Saudi Arabia, Kuwait, Iran, and Iraq. These four countries, with 22 active rigs, normally produce more than 3,500,000 bbl. daily.

The center of drilling activity in Latin America is Venezuela, where 137 rotaries are running. Drilling is fairly equally divided between eastern and western Venezuela.

How Many Rigs are Running and Where

Country—	July 1957	Mar. 1956	Sept. 1955
North America:			
Alaska	2	5	5
British Honduras		1	1
Costa Rica	1	1	1
Cuba	7	12	9
Haiti	1	1	1
Jamaica	1	...	...
Mexico	96	88	76
Total	108	108	93
South America:			
Argentina	58	48	48
Barbados		1	1
Bolivia	10	8	4
Brazil	20	28	28
Chile	4	5	5
Colombia	37	22	21
Ecuador	7	10	10
Guatemala	1	...	...
Peru	16	21	21
Nicaragua	1	...	...
Trinidad	28	26	30
Uruguay		1	1
Venezuela	137	100	120
(Eastern & Cent.)	(68)	(60)	(69)
(Western)	(65)	(36)	(51)
(Barinas)	(4)	(4)	...
Total	319	270	289
Western Europe:			
Austria	32	32	32
British Isles	8	9	6
France	29	29	26
Greece	1	3	2
West Germany	138	106	106
Italy (incl. Sicily)	34	34	30
Netherlands	9	8	8
Portugal	2	2	2
Spain	3	3	3
Total	256	226	215
Africa:			
Algeria	24	14	9
Angola	2	1	1
Egypt	2	8	7
Libya	2	...	...
Madagascar	2	1	1
Fr. Equatorial Africa	10	9	3
Morocco	4	8	9
Nigeria	6	6	6
Tunisia	2	5	8
Ghana	1		
Ethiopia		1	1
Somalia	2		
Mozambique	1	1	1
British Somaliland	1	...	...
Tanganyika	1	1	
Total	60	55	46
Middle East and Eastern Mediterranean:			
Bahrain	1	3	1
Iran	8	5	1
Iraq	5	14	13
Israel	12	12	4
Jordan	1		
Kuwait	5	3	3
Neutral Zone	6	2	2
Trucial Coast (incl. Dhofar and Oman)	4	4	1
Qatar	1	2	2
Saudi Arabia	4	4	4
Syria	1	...	...
Turkey	5	5	5
Total	53	54	36
Other Asia:			
Australia	5	12	14
Burma	2	2	2
Indonesia and British Borneo	24	32	35
India	6	6	6
Pakistan	8	5	5
Japan	15	15	15
New Guinea (incl. Papua)	4	4	4
New Caledonia		1	1
Philippines	2	...	...
Total	66	77	82
Grand total	861	790	761

Here's what some of the companies are doing:

... **Mene Grande Oil Co.** has 36 rigs running, more than any other company in South America. Twenty-five are working on development wells, three on wildcats. The development is concentrated in eastern Venezuela.

... **Creole Petroleum Corp.,** with half its rigs in the Bolivar Coastal fields in Lake Maracaibo, had 19 rigs running in June.

... **Cia. Shell de Venezuela,** another of the major operators, also has an extensive drilling program under way in Maracaibo. Twenty rigs are kept busy on development wells.

Drilling will probably increase both in eastern and western Venezuela because of the recent concession awards. Operators of at least three new Maracaibo blocks already have drilling programs under way—Sun Oil Co., Signal Oil & Gas Co., and Superior Oil Co.

In Colombia, companies are running 37 rigs. Peru has 16 rigs going. The Brazilian government company, Petrolero Brasileiro, S.A., has 16 to 20 wells drilling from month to month. Footage runs about 26,000 to 38,500 ft. per month.

In some Middle East countries operating rigs can be counted on the fingers of one hand.

Saudi Arabia has five heavy rigs in operation. One is drilling a water-injection well, another is on a workover; and a third is drilling from a barge at Safaniya. This leaves only two rigs drilling on the highly productive Saudi mainland.

Iran's picture is somewhat similar. The consortium's operating company has seven active rotaries. Four are at Agha Jari, with one each at Ahwaz, Gach Saren, and Naft Safid. National Iranian Oil Co. has a rig in the Alborz area near Qum.

Israel's drilling campaign is continuing at a fast pace. A dozen rigs are in use. Eight are drilling in Heletz field. One of the key wells under way is the 22 Heletz, located on a structural high. A heavy rig, rated at 15,000 ft., is being used for the test.

More rigs than ever before are currently running in Europe and Africa. In addition to the 138 rotary rigs in West Germany, operators have at their disposal 132 cable tools.

Six wells currently are drilling in United Kingdom. Output is small, about 1,500 bbl. daily. But there are prospects for discovering additional small pools and British Petroleum Co., Ltd., uses its domestic operations as a training ground for drillers later assigned overseas.

Refinery to Expand

Products-line project may mean early start on work

EXPANSION of Chile's Concon refinery may start soon as a result of announced plans for building a products pipeline from the refinery to Santiago.

Empresa Nacional de Petroleos (ENAP), Chile's government company, reaffirmed a project that will add a 24,000-bbl. distillation unit at the Concon plant, which now has a 20,000-bbl. capacity. ENAP also intends to add subtsantial cracking capacity.

The company last year considered an expansion plan that included the distillation unit, a 9,600-bbl. vacuum distillation unit, an 11,000-bbl. fluid catalytic cracker, a 6,000-bbl. catalytic reformer, and a 2,000-bbl. alkylation unit.

The 75-mile, 10-in. products pipeline to Santiago will be built jointly by ENAP, Esso Standard Oil Co. (Chile), and Cia. Petroleos de Chile (COPEC).

Pipe has been ordered for delivery in September, and the line should open early next year. Williams Brothers is the contractor (OGJ, July 1, p. 103).

ENAP also will build a 44,000,000-cu. ft. gas plant and a crude stabilization plant in Manantiales field on Tierra del Fuego. The company raised Manantiales production to 11,000 bbl. daily during the first half of 1957, up 22 per cent over the same period a year ago.

Two Honduras Deals Made

BARNWELL OFFSHORE, INC., of Shreveport, La., has made a deal for an undivided one-half interest in the 48-million-acre Honduras concession held by Compania Petrolera Hondurena, S.A. Barnwell has preliminary plans for drilling two tests within 2 years.

Hondurena has also made a deal for leasing 2 million acres to International Geophysical Exploration Corp., a Panama-licensed firm. H. C. Cockburn is president of International and D. U. Emmert is vice president. Both are of Houston.

Mene Grande Adding Lines

MENE GRANDE OIL CO. has completed one crude pipeline, is working on another, and plans new crude and L.P.G. pipelines this year and next. The project just completed is a 25-mile, 16-in. line from Ceuta, in Lake Maracaibo, to Bachaquero on shore.

A 45-mile, 24-in. crude line from the Oficina producing area in eastern Venezuela to Melones will be completed the first quarter of 1958. The 100-mile, 30-in. line paralleling the company's Oficina-Puerto La Cruz system also will be finished early next year. This line will increase capacity out of Oficina by 300,000 to 500,000 bbl. per day.

A 60-mile, 6-in. L.P.G. line from Anaco to Puerto La Cruz will be started soon. It will be finished late this year. Bottled gas is used for domestic and industrial fuel in Puerto La Cruz.

Red Crews Lagging

Stanvac rig outstripping Romanians at 7 to 1 clip

ROMANIAN DRILLING crews and their Communist-built drilling equipment are not stacking up too well on a footage basis in India's race to find more oil.

At the urging of K. D. Malaviya, socialist-minded head of India's oil commission, the Romanians shipped drilling crews and equipment to India to aid in a government-sponsored search for oil. The first test site was at Jawalamukhi in the Kangra Valley of Punjab. The well was spudded in April.

A few days later, Standard Vacuum Oil Co. started sinking the first test on its 10,000-sq. mile exploratory concession in India's vast Bengal basin. Stanvac's 10,000-ft. test is about 30 miles northwest of Calcutta.

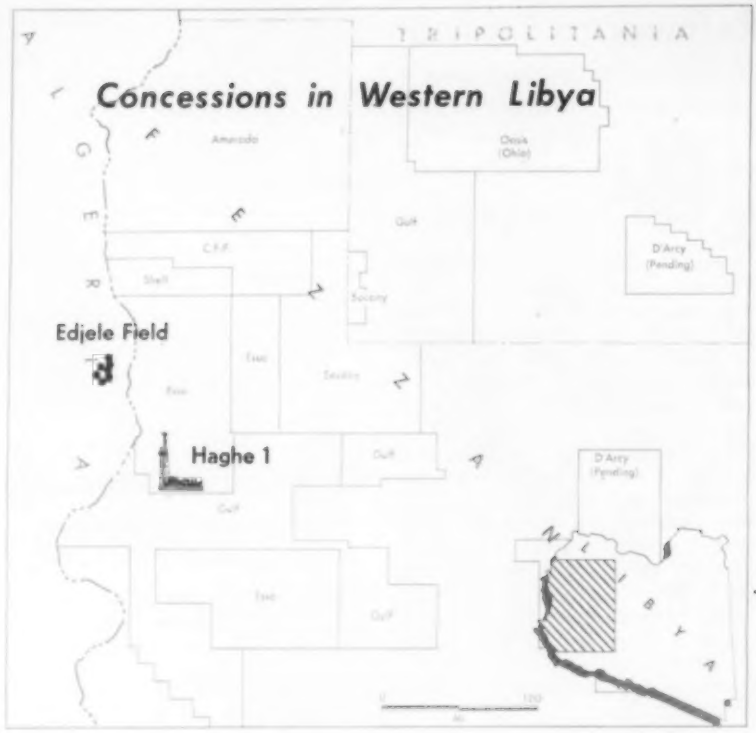
Last week neither had found any oil, but the Romanians are obviously not setting any drilling records. The government's well was only a little below 1,900 ft.—and it had 9,000 ft.-plus to go.

The Stanvac well was at 8,350 ft. with no shows reported.

India Eyes Fertilizer Plant

THE INDIAN GOVERNMENT would like to build a plant in the Bombay area to produce 1,500,000 tons of fertilizers from tail gases of refineries operated by Burmah-Shell Refiners, Ltd., and Standard Vacuum Refining Co. of India.

The government last week had set up a negotiating committee to talk prices with the two refining companies. If an agreement is reached, India would build a plant to produce 500,000 tons a year of ammonium sulfate and about a million tons of nitrogen fertilizers.



Who Holds What

FEZZAN

Company—	Acreage (in sq. miles)	No. of concessions
Esso Standard Oil Co. (Libya)	17,133	3
Amerada Petroleum Corp. of Libya	20,680	1
Cie. Francaise des Petroles	7,066	2
Mobil Oil Co. of Canada	7,610	1
Anglo-Saxon Petroleum Co. (Shell)	1,658	1
Gulf Oil Corp.	25,820	2
D'Arcy Explo. Co., Ltd. (British Pet.)*	11,197	1
Total	91,164	

TRIPOLITANIA (Adjoining Fezzan)

Oasis Oil Co. (Ohio Oil)	9,792	1
Mobil Oil Co. of Canada	407	1
Gulf Oil Corp.	11,239	1
D'Arcy Exploration Co.*	2,702	1

*Pending.

Fezzan Province: An Oil Area?

● Only one rig is running in this desert area of Libya, but several big companies are hoping for a find like those in neighboring Algeria.

THE PROVINCE of Fezzan, once the ugly duckling of Libya's infant oil exploration era, has blossomed into a swan.

When Libya opened its borders for exploration with a new oil law nearly 2 years ago, more than a dozen oil companies scrambled for acreage in the new country. Fezzan, the remote and almost trackless desert province in the southwestern corner of the newly created kingdom, was all but ignored. Only three companies applied for land in this area. One of them lost its concession 8 months later because it did no work.

To the north along the Mediterranean Coast in Tripolitania and Cyrenaica provinces things were different. Applications for acreage conflicted so badly it took months to straighten them out. The concession maps of this region looked like a patchwork quilt (OGJ, Jan. 16, 1956, p. 87).

All that has changed now.

Fezzan is fast becoming the hottest area in the entire country. Originally just slightly less than 58,000 sq. miles of Fezzan was under concession. Then, Libyan American Oil Co. (Texas Gulf Producing Co. and W. R. Grace) let its 28,233-sq.-mile concession in two large blocks go because the company regarded the area as too remote and expensive to work. This left only Esso Standard Oil Co. (Libya) with 8,020 sq. miles and Amerada Petroleum Corp. with 20,680 sq. miles.

Today six companies have more than 80,000 sq. miles under concession in Fezzan. A seventh has applications for another 12,000 sq. miles pending (see map). Included in these concessions is part of the area originally held by Libyan American.

What caused it all . . . Libya can thank its neighboring Algeria for the new interest.

The French-Shell discovery at Edjele made by Cie. de Recherche et d'Exploitation de Petrole au Sahara (C.R.E.P.S.) started the ball rolling. The interest has continued to mount as C.R.E.P.S. develops its shallow field just across the frontier in Algeria. The Algerian field discovery made at Hassi Messaoud was even more spectacular, but it is much farther to the north and west. But the feverish French activity in Algeria infected Libya and made the desert wastes that were once ignored look much better.

In addition to the more than 91,000 sq. miles in Libya's Fezzan, three companies have obtained new acreage in the Province of Tripolitania which borders Fezzan just to the north and east. A fourth has an application pending. Oasis Oil Co. (Ohio Oil Co.) already a large land holder in Libya, has been granted another 9,792 sq. miles; Socony Mobil Oil Co., through its subsidiary Mobil Oil Co. of Canada, has been granted 407 sq. miles; Gulf Oil applied for and received 11,239 sq. miles; and D'Arcy Exploration Co. (British Petroleum) has an application for 2,702 sq. miles.

Who is drilling . . . Only one of these companies has started any drilling.

Esso is drilling Haghe 1 at the extreme southern edge of its original Fezzan acreage. Last week the well was reported drilling below 2,200 ft. Esso isn't attempting to make any evaluation of the prospect at this time, but the test encountered oil sands at three different intervals before reaching 1,200 ft.

A core drilling rig doing structure holes for Socony Mobil (and looking for water at the same time) encountered a high-pressure gas zone just below 1,500 ft. and the crew had a hard time controlling the gas flow before the hole was finally cemented. This occurred on Socony's acreage just to the east of Esso's.

Socony will test its Fezzan acreage with a heavy rig that is being prepared for shipment from Houston.

Crude, gas lines to be built . . .

Argentina Makes Pipeline Deal

ARGENTINA took a major step forward to develop its oil industry last week when it awarded American and European interests a $115-million contract for pipelines and other facilities.

The move is part of a larger program to expand transportation, producing, and refining facilities to reduce the $200-million annual foreign-exchange bill for oil and other fuel imports.

The construction program, planned for years, has been thwarted in the past by politics and lack of financing for the ambitious projects. Financing was arranged through various European countries in which Argentina has a credit balance.

Argentina's deal . . . The development in Argentina last week will bring into the nation pipeliners from the United States and Europe.

The Argentine state oil agency accepted the $115 million bid of the TIPSA syndicate in preference to one offered by a 33-company consortium of other U.S. and European firms.

TIPSA's total bid on all projects up for letting was $250 million, but the Argentine agency—Yacimientos Petroliferos Fiscales (Y.P.F.)—postponed action on other construction worth $135 million.

The awarded contract consists of a 1,015-mile, 24-in. natural gas pipeline from Camp Duran field in Salta Province to Buenos Aires and a 930-mile, 12-in. crude line from the field to San Lorenzo on the Parana River.

Not awarded was the contract on a 625-mile, 12-in. crude line from Mendoza to San Lorenzo. New bids may be asked.

Among the American companies participating in TIPSA are Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, and North American Utility and Construction International Co. European firms, which will supply financing for the projects awarded, include Austrian Government banks, N. M. Rothschild & Sons, Ltd., Credit Lyonnais, and Banco di Roma per la Svizzera.

If the word of Gen. Alfredo Intzaurgarat, Y.P.F. president, can be taken literally, Argentina will be over the hump when the pipeline facilities are completed. Intzaurgarat said only last month his country has no problem finding oil—that the country's proved crude reserves are 2.3 billion barrels.

This figure, however, is several times previous reserve estimates.

Y.P.F. also is still hard put to keep its daily production ahead of Argentina's crude imports. The agency is producing a little more than 88,000 bbl. daily from Argentina fields, and imports from the Middle East and Venezuela are just slightly under that figure.

President's position . . . Gen. Pedro Aramburu, the provisional president of Argentina, apparently is convinced that foreign development is necessary if the nation is to produce what it needs. But Aramburu is well aware that the straw that broke the back of deposed President Juan Peron was his effort to grant a concession to Standard Oil Co. of California.

Each time Aramburu makes a public statement favoring foreign oil development in Argentina, political expediency forces him to back water.

Another complication is hindering the nation's oil program. Individual Argentine provinces are becoming out-and-out states' righters. Aramburu has tried to encourage federalism in the country, and he may be succeeding too well.

Independently minded provinces are refusing to sign agreements with Y.P.F. for oil exploration. They contend the agency wants terms far too liberal. The Salta Province governor turned down Y.P.F. flatly, and other provincial governors are expected to follow his lead.

Mattei's Iranian Deal Made?

ENRICO MATTEI, wily head man of Italy's not very successful state-owned oil company, has apparently made his deal in Iran.

Reports from Teheran indicate that Mattei can claim to be the first to negotiate a new oil agreement in Iran under the terms of new oil legislation that country just passed (OGJ, July 15, p. 77).

The agreement, between National Iranian Oil Co. and Azienda Generale Italini Petroli, was first revealed in April by the Italians (OGJ, May 6, p. 94). It took recently passed legislation to make it legal.

The agreement . . . N.I.O.C. will become a full but nonpaying partner in a new company to be called Soc. Italo-Iraniana dei Petroli (SIRIP), which will look for oil in three separate areas covering a total of about 8,800 sq. miles.

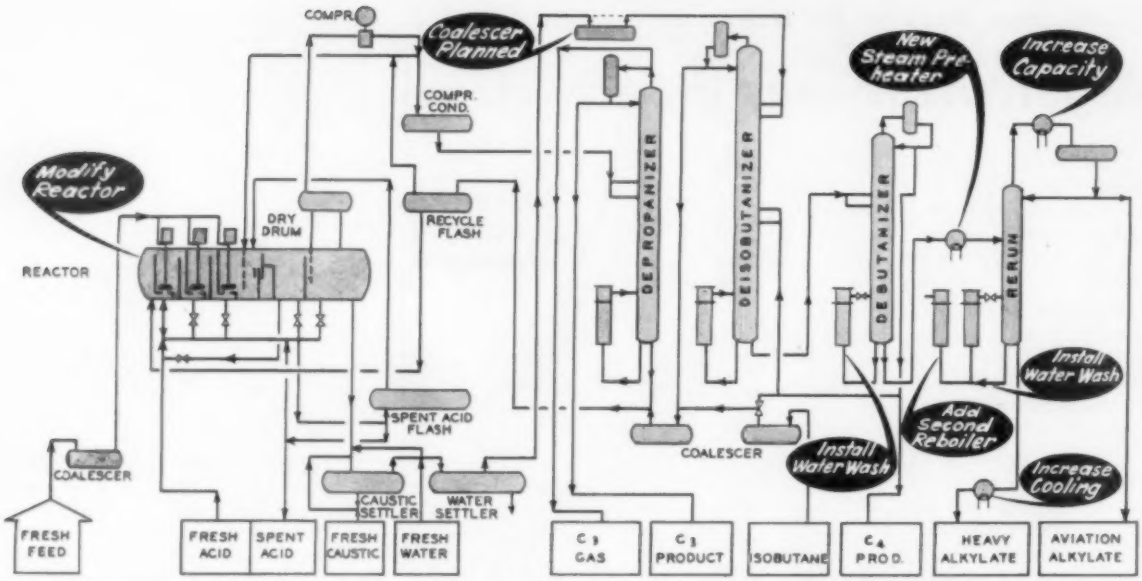
The Italians will put up all the exploration money and split any profits 50-50—first with N.I.O.C. and then again with the Iranian Government. This would leave the Italians only a 25 per cent return.

The three areas include a tract on Iran's Continental Shelf beneath the waters of the Persian Gulf, a second block in southern Isfahan, and a third along coastal Baluchistan on the Gulf of Oman in extreme southern Iran.

Mattei's political ability in Italy is widely recognized. But as head of Ente Nazionale Idrocarburi (E.N.I.), the Italian government oil agency which controls A.G.I.P., his success has been far from notable. With a virtual monopoly on the Italian mainland, E.N.I. has failed in its attempts to develop a successful oil industry.

Mattei's efforts to move into foreign oil exploration in the face of his lack of success at home have subjected him to severe criticism in Italy. He has so far weathered these political storms.

But observers doubt if Mattei can raise the necessary money for a full-fledged exploratory program in Iran without facing even more criticism in Italy.



INCREASED throughput and improved operation has resulted from modifications made in Standard Oil Co. of Texas' alkylation unit at the El Paso refinery.

Alkylation Unit Modifications Improve Operating Conditions

By Larry Resen
District Editor

MODIFICATION of the alkylation unit has improved operating conditions and resulted in increased throughput at the El Paso refinery of Standard Oil Co. of Texas.

The M. W. Kellogg-designed sulfuric acid unit is now producing an average light alkylate product in excess of 1,450 bbl. per stream day. The unit charges olefin with a high proportion of propylene, without adverse effect on acid consumption.

Changes to the unit include reactor modifications to prevent vapor carryover, additional heating, condensing and cooling capacity on the rerun tower, and installations of water-wash systems on the rerun tower and debutanizer reboilers which have reduced down time previously due to fouling of these items.

Unit flow . . . Fresh feed is received from the plant's Houdry catalytic cracking unit and thermal cracker after first undergoing caustic scrubbing and a water wash. This charge on a typical day (Table 1) averages 2,350 bbl. Of this, about 9 per cent is propylene, 29.4 per cent is butylenes, and 27.5 per cent is isobutane. This breaks down to 212, 690, and 650 bbl., respectively. An additional 488 bbl. of makeup isobutane is also added. Propylene charge amounts to 23.2 per cent of straight olefin feed.

Before the incoming stream is charged to the reactor, it is first passed through a coalescer. This was designed to remove entrained water picked up in the water-wash system. The cascade-type reactor receives the incoming olefin feed as three parallel streams, each entering one of three reactor zones.

Fresh acid, refrigerant liquid recycle isobutane from the deisobutanizer, and recycle acid enter the first zone and pass through the other two zones in series flow.

Reactor changes . . . Modifications were made to the reactor as suggested by Kellogg for improving its operation. In the reaction zone, isobutane and acid liquids flow via baffles to the intake of an internal mixer. Here, they meet a large circulating mass of isobutane-acid emulsion.

In the mixer, incoming acid, hydrocarbons, and circulating emulsion are pumped past the olefin feed distributors, through reaction tubes, the vapor-disengaging zone, liquid-settling zone, and then back to the intake of the mixer. Before returning to the emulsion pump inlet, a portion of the hydrocarbon phase equal to the incoming feed stream passes to the next reaction stage. The mixing cycle is repeated there and in the third stage.

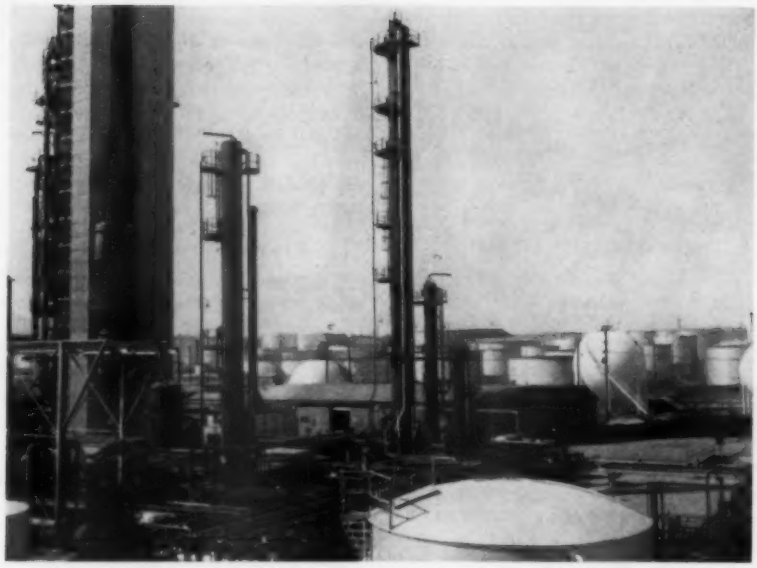
Vent holes are provided around the

TABLE 1—TYPICAL OPERATING CONDITIONS

	Case A		Case B	
Fresh feed:	B/SD	%	B/SD	%
C_3=	204	8.8	220	9.2
C_3	282	12.4	289	12.1
iC_4	660	28.5	635	26.6
C_4=	734	31.7	646	27.1
nC_4	312	13.5	468	19.6
iC_5	118	5.1	129	5.4
Total fresh chg.	2,310	100.0	2,387	100.0
iC_4 makeup	498		477	
Yields:				
C_3	370		341	
C_4	508		641	
Lt. alky.	1,519		1,487	
Hvy. alky.	245		240	
F-4 4 cc. TEL	142.6		142.3	

TABLE 2—A.S.T.M. DISTILLATION

Per cent rec. at 12.8 psia.	Light alkylate	Heavy alkylate
I.b.p.	104	284
5	133	302
10	148	309
20	171	328
50	206	352
70	217	370
90	234	433
95	251	495
End point	328	544
Total per cent recovered	99	98
R.v.p.	7.8	...
F-4 4 cc. TEL	146	...



ALKYLATION UNIT is in center foreground with catalytic cracker at left.

top of each mixer so vapors which disengage from the liquids can be diverted through a vent line to a compressor used for refrigeration purposes. Excess liquids from this recompression stage feed the depropanizer. High throughput was desired in the reactor without liquid carryover into the vapor lines. To achieve this, some of the vent holes were blocked off and the remainder were enlarged to provide the same amount of vent area at the top of the reactor. The vent holes which were blocked off were those on the downstream side of the mixer and adjacent to the vapor line leaving the particular zone.

With this arrangement, the vapor containing emulsion leaving the mixer is directed away from the vapor line. This results, in effect, in a reduction in quantity of entrained acid since the vapor has to change direction to reach the outgoing line. This reduces the possibility of carrying acid vapors up the line and into the compressor system.

Reactor baffling . . . The three reaction zones are formed by baffling. The baffle arrangement between the first and second and second and third zones consists of an upstream overflow baffle open at the top and a downstream L-shaped baffle open at the bottom.

Sight glasses were placed in the space between the baffles, and valves were put in the vapor line from each zone. These valves are adjusted to give the pressure differential (approximately 1-2 psi.) between zones required to hold a level in the sight glasses and prevent vapor carryover with the liquid from zone to zone. This increased the mixing in each zone as evidenced by an increase in the mixer horsepower.

Vapor flow out of the reactor is standard, with the vapors being compressed and part of the stream used for refrigeration and the remainder charged to the depropanizer. Overhead products here are propane gas and liquid, while bottoms are charged to the recycle flash drum along with deisobutanizer tops for return to the reactor.

Products separation . . . Reaction products are separated from the acid in the settling zone of the reactor and charged to fractionation equipment. It is planned to install a specially packed coalescer in this system downstream of the caustic-water wash facilities.

Separation of isobutane recycle takes place in the deisobutanizer and separation of butane from the alkylate is accompanied in the debutanizer. Under design conditions, a purchased isobutane stream of 75 per cent purity was also to be charged to the deisobutanizer. However, it has been possible to obtain 94-98 per cent purity and hence this tower is bypassed by this incoming isobutane stream.

Further separation of the polymer into desirable light alkylate and heavy alkylate is accomplished in the rerun tower. This latter installation was modified to provide for greater overall unit capacity. A steam preheater was placed on the feed line to the tower as the first step in this expansion program.

The increased loading required additional modifications to be made to the overhead condenser capacity so as to handle larger amounts of light alkylate. Likewise, increased output of heavy alkylate required more cooling capacity on the bottoms drawoff from the tower.

Reboiler changes . . . Twin parallel reboilers installed on the rerun tower originally were operated alternately. When one unit became fouled by deposits resulting from alkylate ester decomposition, the reboiler was taken off stream, the tube bundle pulled, and then mechanically cleaned. These reboilers have been modified to permit cleaning by high-pressure water wash on the hydrocarbon side. The alkylate ester deposits being to a large extent water soluble are removed by the high-pressure water jets so that the reboilers can be water washed.

A water-wash arrangement has also been made on the debutanizer reboiler. Since this is not a dual installation, the tower cannot operate temporarily on the other reboiler as in the case of the rerun tower. However, when the debutanizer reboiler requires cleaning, deisobutanizer charge is directed into storage and the water wash is used to clean the reboiler.

With these modifications, plant throughput has been increased without any major changes to the unit. It was designed for 1,128 bbl. per stream day of light-alkylate product and is now averaging 1,450. Fresh-feed design was 1,750 bbl. per stream day and the unit now averages about 2,400 bbl.

Operating with the high-propylene charge stock has been practical with a reasonable acid consumption rate. On the basis of total rerun charge stream, acid consumption has averaged 0.85 lb. per gal. Light-alkylate yield on basis of volume per cent of olefin charge averages 166½ per cent. Total alkylate yield averaged 194 per cent on basis of typical data in Table 1. Isobutane in reactor effluent is held at 60 per cent liquid volume. F-4 performance number on these days averaged 142.5, with 4.0 cc. TEL, somewhat lower than is customary for the unit.

Acknowledgments

Cooperation of the management of Standard Oil Co. of Texas in the release of this information and assistance of Lew Bauer and Cliff Novelli in compilation of data and material are gratefully acknowledged.

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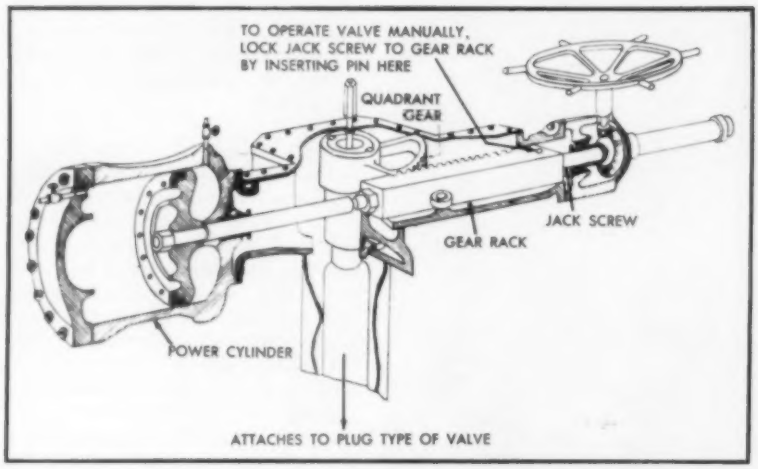

TO OPERATE VALVE MANUALLY, LOCK JACK SCREW TO GEAR RACK BY INSERTING PIN HERE
QUADRANT GEAR
JACK SCREW
GEAR RACK
POWER CYLINDER
ATTACHES TO PLUG TYPE OF VALVE

POWER-DRIVE mechanism for automatic or remote-control valve-operating system. Fig. 1.

Emergency Shutdown Equipment Safeguards Compressor Stations

By W. E. Warner

THE records will show that the handling of high-pressure natural gas cannot be considered a very hazardous occupation. This is rather surprising when you consider the enormous quantities of energy handled daily through a compressor station and the fact that the confined forces are continually at work to break through at any possible initial or subsequently developed structural defects.

It is not surprising, however, in view of the continued thought and effort being applied to safeguard against the hazards involved.

To insure maximum safe working conditions in the operation of a natural-gas compressor station, every consideration must be given to the following five details:

1. Design of equipment and selection of materials to be used.

2. Expert construction and erection of equipment with final testing for material defects and the protection of material against corrosion.

3. Adoption of safe operating procedure and the training of personnel to comply.

4. Constant vigil for material defects, design and construction defects, and material deterioration.

Author is with Natural Gas Pipeline Co. of America, Hooker, Okla. Paper presented at twelfth annual short course in gas technology, Texas College of Arts and Industries, Kingsville.

5. The employment of safety devices to prevent the occurrence of an explosion, and to prevent further injury to personnel as well as excessive property damage in the event of a material rupture.

The discussion which follows is confined entirely to the subject of safety devices which have been developed and are now in use on the Natural Gas Pipeline Co. of America and the Texas Illinois pipeline systems.

First Concern Is Safety

When a rupture in a high-pressure system occurs, especially one resulting in fire, there is naturally a great amount of confusion in the first few moments following the break. Even though there are a few men who can analyze the situation immediately and bring it under control, the chances are that such an individual could act only at a risk to his own safety.

The first concern of management in the event of a blast is for the safety of personnel. All other matters become secondary in importance. It is the first duty of every man in the vicinity of a blast, to himself and to his company, to immediately vacate the danger area. The only exception to this, of course, would be for the purpose of saving a fellow employe from severe injury or death.

When a rupture in a high-pressure system followed by fire occurs, the immediate property damage may be light when compared to that resulting from prolonged burning. And if the gas can be shut off, and pressure relieved at the break before fire occurs, the relative damage done may be inconsequential.

Remote Shutdown System

The first few moments following a break therefore become of utmost importance. A remote-control system that would act on the pull of a lever to shut off the gas supply, blow down all pressure in the station yard and at the same time shut down all operating engines, would be invaluable in such an event. A control system to do just that is shown by the sketch in Fig. 2.

Valve operation . . . The sketch shows plug type of valves for both main-line shutoff and blowdown which are closed or opened by a quarter turn of the valve stem. All valves are power driven by an attached piston-cylinder arrangement as shown in Fig. 1. The motivating energy is the high-pressure gas and it will be noted in Fig. 2 that a pressure reservoir is used to feed gas to the power cylinders.

The reservoir is pressured from gas on the discharge side of the plant to provide maximum available energy. The check valve installed on the reservoir inlet prevents a back flow from the reservoir to the discharge line in case of a bad break with resultant rapid drop of pressure. Regardless of the size of a break, a maximum amount of energy will always be available for actuating the valves.

The system is designed so that it can be operated from any one of a number of control stands. The location of the control stands must be given some study and will vary in accordance with the plant layout. At least one stand should be located close to an exit of the main compressor building or near the auxiliary building, if any, for ready access to the operating crew. Another should be located in a safe area, preferably at a door of an office building where someone is available part time. As many control stands should be located in safe areas as it considered necessary for any particular plant layout.

Bleeder valves . . . Fig. 2 shows a bleeder valve provided just downstream from the control valve. The bleeder valve, normally open, is for the purpose of bleeding off any slight leakage past the control valve that might otherwise build up a pressure in the power pistons and cause them

to move. The bleeder valves can be linked to the control valve actuating lever in such a manner that the quarter turn of the lever necessary to open the control valve will at the same time close the bleeder valve. With such an arrangement an individual on the fly can operate the system without much loss of speed.

Fig. 2 also shows a pressure connection to a pressure switch in the main compressor building. This is to cut off ignition current supply to all engines and thereby shut down the station when the remote-control system is operated.

Thus by a simple arrangement a system can be provided that may save thousands of dollars in property damage, not to mention lost operating time and curtailment of deliveries.

Safety at Vulnerable Installations

A system using the same power-drive mechanism as shown in Fig. 1, is made fully automatic and installed on the main line in vulnerable isolated spots away from the plant area. On certain river crossings for example, a power-driven valve is installed in the line on each side of the river. A line break between valves will cause both valves to close automatically.

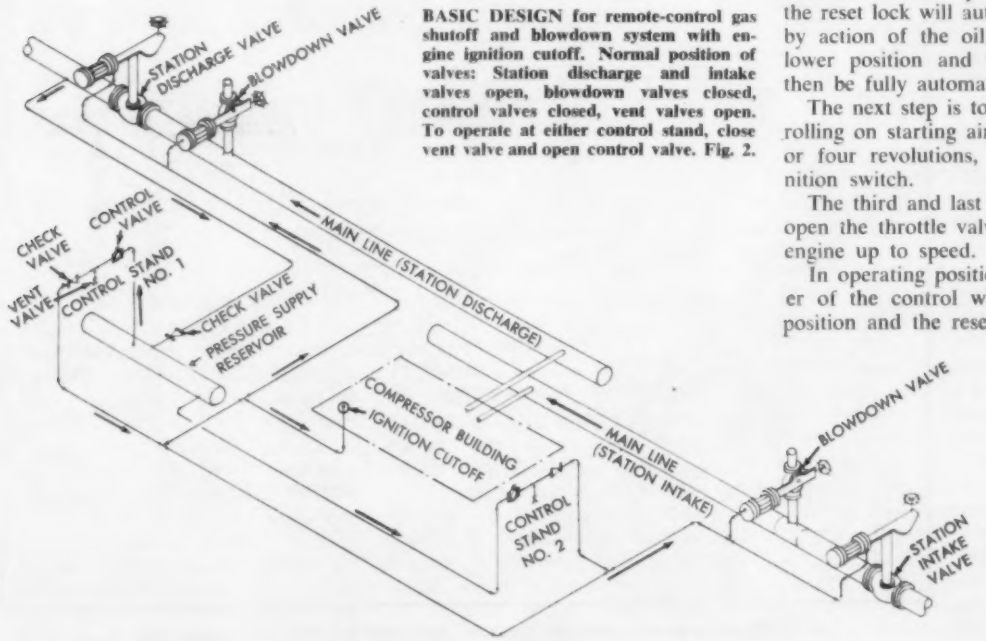
This is done by taking a pressure supply from the main line, through an individual check valve and reservoir arrangement for each valve, and piping the reservoir to the outboard end of the power cylinder. The inboard end of the power cylinder is piped directly to the main line and, normally, both sides of the piston are subjected to main-line pressure. In the event of a sudden drop in main-line pressure, the pressure in the inboard end of the cylinder will drop accordingly while outboard end cylinder pressure remains fixed. This establishes a differential pressure that will start the piston moving and close off the valve.

Explosion Danger Spots

The safety devices covered thus far are to be used after a rupture has occurred or when it is evident that one is about to occur. Other safety equipment used while starting engines is for the purpose of preventing explosions of a more minor nature.

For example, engines using fuel injection must be supplied with fuel gas under pressure, and leakage into an idle engine can produce an explosion when the engine is started. This is especially serious in regard to two-cycle engines where explosions are liable to occur in the scavenge pumps. Scavenge pumps have been shattered due to explosions of this nature, and in such instances there is considerable danger to personnel from flying pieces of cast iron.

The four-cycle turbocharged engine is vulnerable to severe exhaust-line explosions. Such explosions are likely to occur during the starting operation, but happen more generally when an engine dies on load. Esuipment has been devised that protects the engine by automatically venting fuel gas pressure to the atmosphere when the engine is either shut down intentionally, or dies on load from some cause.



BASIC DESIGN for remote-control gas shutoff and blowdown system with engine ignition cutoff. Normal position of valves: Station discharge and intake valves open, blowdown valves closed, control valves closed, vent valves open. To operate at either control stand, close vent valve and open control valve. Fig. 2.

Protecting Four-Cycle Engines

Shutdown system . . . Fig. 3 shows such an arrangement. The combination fuel gas safety shutoff and blowdown valve is not a pressure-regulating valve. It serves merely to shut the gas off the engine completely and blow down the header system ahead of the injection valves. When the engine is operating, this valve is wide open and the blowdown vent is closed. Its action is automatic, the motivating energy being pressure gas from the main fuel-gas supply header acting against a spring loaded diaphragm.

The opening and closing of the safety shutoff valve is a function of the Fulton-Sylphon control, which in turn is actuated by either oil pressure from the turbine lubrication system or cooling-water temperature. When an engine is in operation either low turbine-oil pressure or high jacket-water temperature will trip the three-way valve of the Fulton-Sylphon control, thus cutting off the pressure supply to the diaphragm of the safety shutoff valve and venting the diaphragm to atmosphere. The safety shutoff valve then snaps shut, cutting off the gas supply to the engine and venting the downstream piping to atmosphere.

Start-up procedure . . . To start an engine with the arrangement as shown by Fig. 3, the first step is to pull up both reset and reset lock levers of the Fulton-Sylphon control. This action pressures the diaphragm of the safety shutoff valve and opens it wide. It temporarily removes the control from automatic status, however as soon as turbine-oil pressure comes up, the reset lock will automatically drop, by action of the oil pressure, to its lower position and the control will then be fully automatic.

The next step is to start the engine rolling on starting air and after three or four revolutions, turn on the ignition switch.

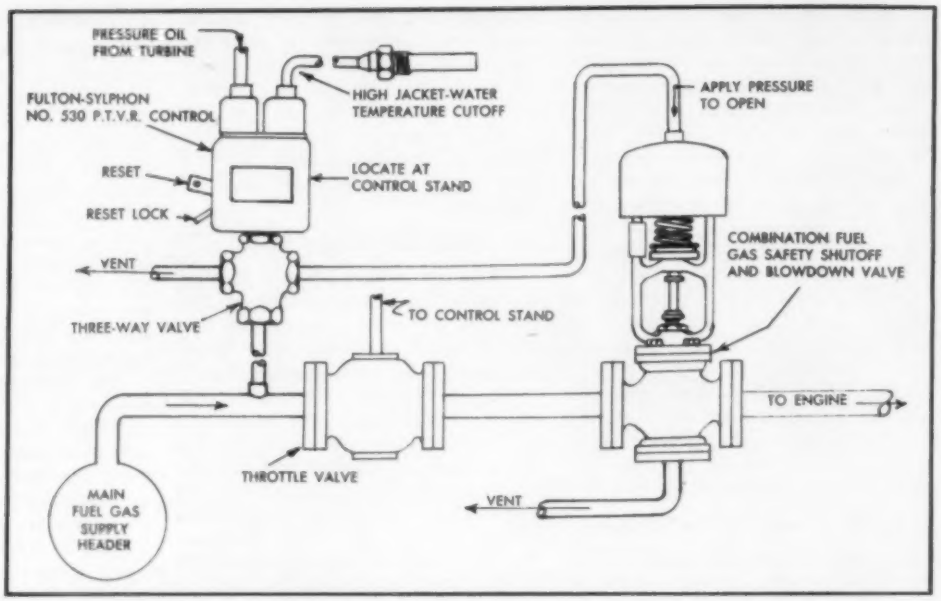
The third and last step is to slowly open the throttle valve and bring the engine up to speed.

In operating position, the reset lever of the control will be in the up position and the reset lock lever will

be in the lower position as shown in Fig. 3. Either low turbine-oil pressure or high water temperature will drop the reset lever to its lower position and this action will shut the engine down as previously described.

Protecting Two-Cycle Engines

The safety starting and automatic shut down equipment for two-cycle engines as shown by Fig. 4 goes a step further than the equipment of Fig. 3. Fuel mixtures for the starting operation are automatically controlled and the engine is started on a wide-open throttle. This is accomplished by the fuel-gas proportioning valve, the opening of which is controlled automatically by scavenge-air pressure. When the engine is down and scavenge-air pressure is 0, the proportioning valve is closed, and its vent open to bleed gas pressure in the piping ahead of the gas-injection valves to atmosphere.



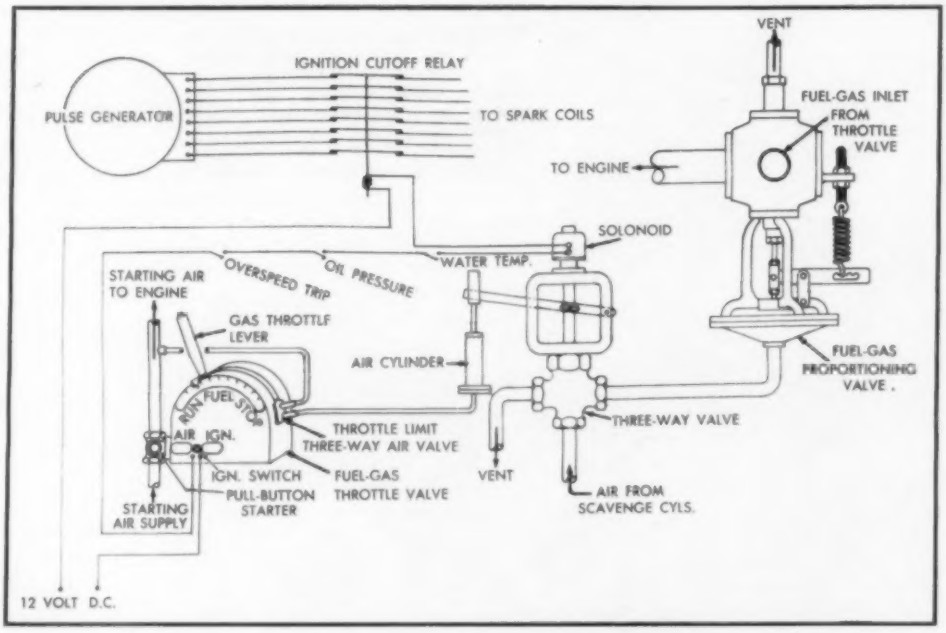
AUTOMATIC fuel-gas shutoff and blowdown arrangement for turbocharged engine. Fig. 3.

Start-up procedure . . . To start a two-cycle engine with the equipment as shown in Fig. 4, the first step is to pull the pull-button air-starting valve and start the engine rolling on starting gas.

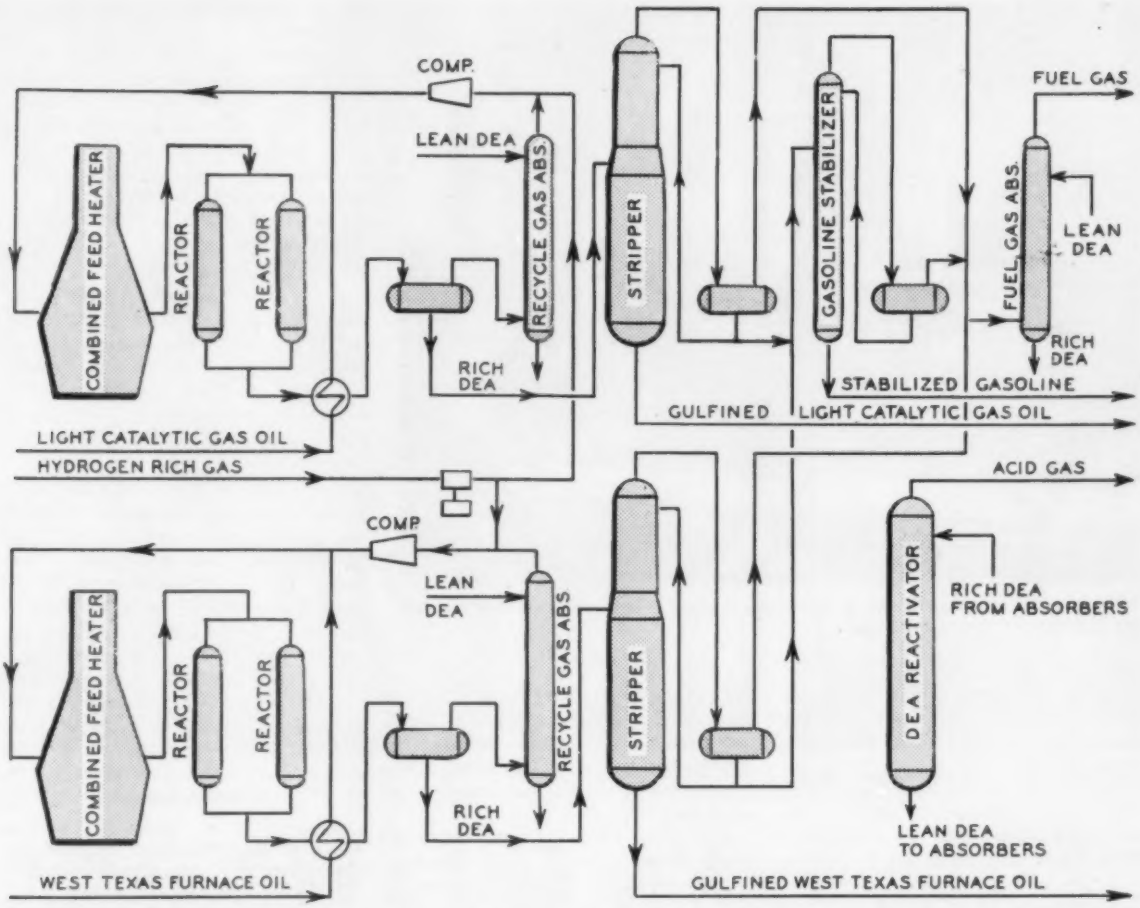
The gas throttle lever will be at stop position and locked there by the open ignition switch. With the gas throttle lever in the stop position, the throttle limit three-way air valve will be in position to admit starting air to the air cylinder. The air cylinder piston then moves to open the solenoid three-way valve which is positioned by the action to admit scavenge-air pressure to the diaphragm of the proportioning valve. Thus the proportioning valve is positioned to admit the proper amount of gas for starting before the gas-throttle valve is opened.

The second step in the starting operation is to close the ignition switch and move the gas throttle lever to the run position. The gas-throttle lever will be unlocked from the stop position by the closing of the ignition switch. When the gas-throttle lever is moved from stop position, the throttle limit three-way valve vents the air cylinder to atmosphere. The solonoid valve remains unchanged because its position will now be maintained by the solonoid which becomes energized when the ignition switch is closed. The engine should now fire and come up to speed.

Interruptions . . . It will be noted by the electrical circuits in Fig. 4 that when a forced interruption occurs, whether caused by overspeed trips, low oil pressure, high water temperature, or a d.c. power failure, fuel pressure in the headers is immediately vented to atmosphere and the ignition is cut off. **End.**



SAFETY starting and automatic shutdown equipment for two-cycle engine. Fig. 4.



THIS SIMPLIFIED DIAGRAM indicates how Gulfining units are used at Gulf's Porth Arthur refinery. The two new units process 49,000 bbl. daily of furnace oil and gas oil.

Two New Gulfining Units Exceed Design Capacities

By Larry Resen
District Editor

GULF OIL CORP. has placed two Gulfining units on stream at its Port Arthur, Tex., plant with a combined design capacity of 45,000 bbl. per day.

The two units, which went on stream in November 1956, have been operating at a combined capacity of close to 49,000 bbl. per day. Charge stocks consist of segregated streams of light catalytic gas oil and West Texas furnace-oil distillate.

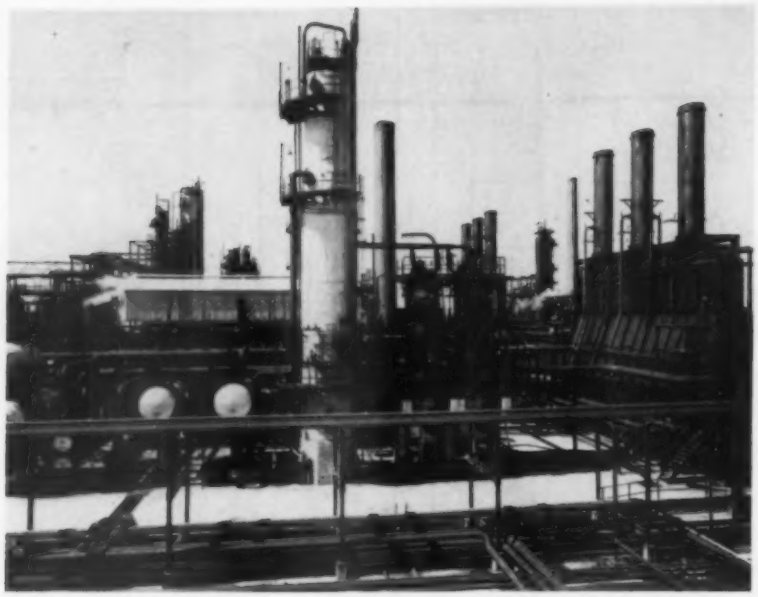
In the process, these streams are hydrogenated with catalytic reformer offgas. Hydrogen treating of these stocks results in hydrogenation and desulfurization and an improvement in the color and stability of the final furnace-oil products.

The basic process design was done by Gulf, while M. W. Kellogg Co. was responsible for the detailed process and mechanical design, and construction of the units.

The process is similar to other hydrogenation techniques in that hydrogen is reacted with the distillate streams in the presence of a catalyst at elevated temperatures and pressures. In the Port Arthur installation, the process flow is set up so that actual hydrogen treating takes place in two separate units. These share basic facilities, such as a gasoline stabilizer and a diethanolamine regeneration system.

Process . . . The Gulfining process is a straightforward operation. Feed stocks are preheated by exchange with reactor effluent mixed with recycle gas and heated to reaction temperature in a gas-fired heater. The heated reactor charge passes through fixed-bed reactors. In the reaction, combined sulfur is substantially converted to hydrogen sulfide. A small amount of lighter components are formed by breakdown of the sulfur-containing compounds.

The reactor effluents are cooled and separated at substantially reactor operating pressure in order to minimize the horsepower required for hydrogen recirculation. The recycle gas is scrubbed with DEA in separate absorbers to remove H_2S and thereby reduce its corrosivity. The liquid stream from each separator is charged



GENERAL VIEW shows stripper in center with reactors at right and furnace at far right. Metal shed at left houses compressor.

to a low-pressure stripper tower for removal of 380 end point material. The Gulfined product is withdrawn as a bottoms product.

Hydrogen-rich gas from the reforming units is continuously added to the process through a feed gas compressor. This single unit feeds the hydrogen-rich gas to both recycle gas streams just upstream of the recycle gas compressors. These latter units feed directly into their individual reactor groups. Individual separation and recycle gas systems were provided on each unit so that the operating pressure, temperature, hydrogen purity, and hydrogen consumption can be independently controlled for each specific charge stock to give the desired percentage of desulfurization and saturation.

The gasoline streams from the strippers are combined and the joint stream is charged to the stabilizer where a stabilized gasoline bottoms product is recovered. Gas taken overhead is combined with that from the two strippers, treated for hydrogen sulfide removal and used as a treated-fuel gas product.

Rich amine solutions from the recycle-gas absorbers and fuel-gas absorber are charged to a common diethanolamine reactivator. The acid gas is utilized in an existing sulfur recovery plant.

Operating data . . . In operations to date, two feed stocks have been charged to the units. A light catalytic gas oil has been charged to Unit 241, which has a design capacity of 20,000 bbl. per day and a West Texas furnace-oil distillate has been charged to Unit 242, which has a design capacity of 25,000 bbl. per day. Operating data is compared with original design data in Table 1.

Charge to Unit 241 has been well over design, being approximately 24,000 bbl. daily, or 4,000 bbl. above design. The second unit operating on the furnace-oil distillate, meanwhile, has operated practically at design rate. Hydrogen consumption is considerably higher on Unit 241 than on Unit 242. While this has been partially due to the higher sulfur content in the cracked gas oil, it is also partially due to the olefin hydrogenation taking place on this stock. Reactor conditions of the two units are tailored for long, active catalyst life.

Laboratory inspections (Table 2) show almost a 2-point increase in A.P.I. gravity on the cracked gas oil and an 0.8-point increase in gravity of the furnace-oil distillate. Sulfur content is reduced from 0.84 weight per cent to 0.08 in the case of the catalytic gas oil and from 0.66 to 0.05 on the furnace-oil distillate.

The A.S.T.M. distillations of both charge and product are essentially the same. There is a slight rise in the initial boiling point in both instances and this is primarily due to stripping off of the lighter material during the process. The combined gasoline product has a research octane number of 90.5 leaded. Marked improvements are noted in color and stability of the products.

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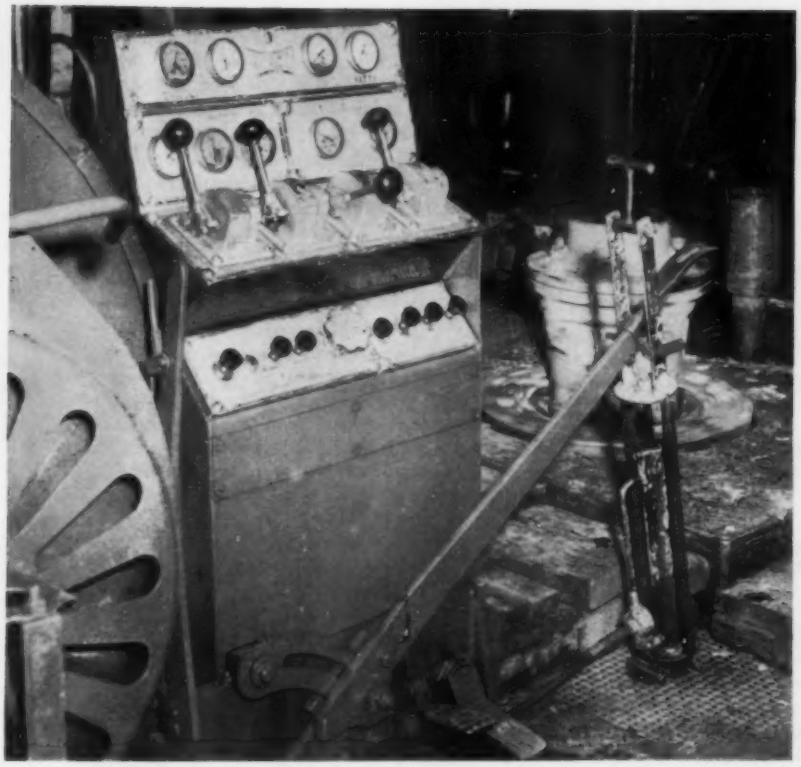
TABLE 1—OPERATING DATA (DESIGN VS. ACTUAL)

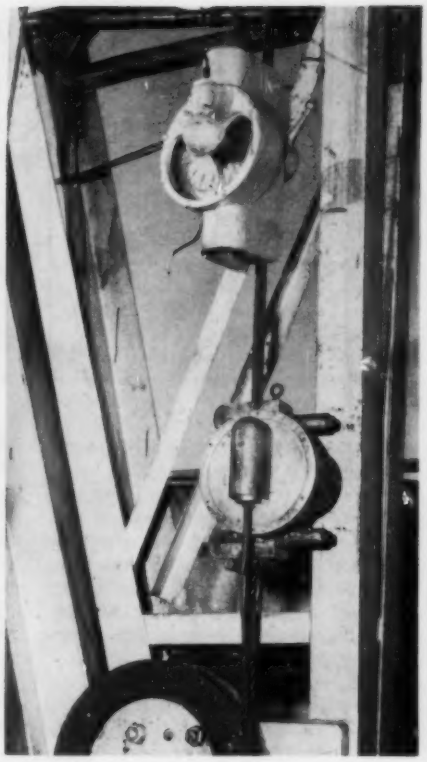
	Unit 241		Unit 242	
	Design	Actual	Design	Actual
Charge:				
Type	Light catalytic gas oil		West Texas furnace oil distillate	
Barrels per stream day	20,000	23,986	25,000	24,970
Gravity, °A.P.I.	24.0	26.8	36.0	40.1
Sulfur, weight per cent	0.90	0.84	0.53	0.66
Gulfined product:				
Sulfur, weight per cent	0.09	0.08	0.045	0.05
Sulfur removal, per cent	90	90.5	91.5	92.4

TABLE 2—LABORATORY INSPECTIONS

	Unit 241		Unit 242		Combined
	Charge	Product	Charge	Product	stab. gaso.
Type charge	Light catalytic gas oil		West Texas furnace-oil distillate		
Gravity, °A.P.I.	26.8	28.7	40.1	40.9	47.1
Sulfur, weight per cent	0.84	0.08	0.66	0.05	...
Distillation, A.S.T.M.:					
I.b.p., °F.	416	436	346	360	242
10 per cent	466	468	380	390	268
50 per cent	524	520	440	448	298
90 per cent	590	584	544	554	340
End point	630	626	610	606	380
Recovery, per cent	98	98	98	98	98
Color No.:					
A.S.T.M. (Union)	1½	1¼	...	...	...
Saybolt	...	...	—5	25+	...
Knock rating:					
Motor octane number					72.4
Plus 3 ml. TEL					85.2
Research octane number					77.0
Plus 3 ml. TEL					90.5
R.v.p.					0.5



BRAKE RELEASING DEVICE keeps constant weight on the bit after the driller sets it at the desired level. Pulses of air operate a piston releasing the brake. Fig. 1.



DEADLINE tension-measuring element senses changes in weight hanging from block. Fig. 2.

Drillers Take a Look at Automation

. . . New weight-control device works automatically

By W. C. Gresham, O. E. Mecham, K. J. Ward, and R. H. Ashby

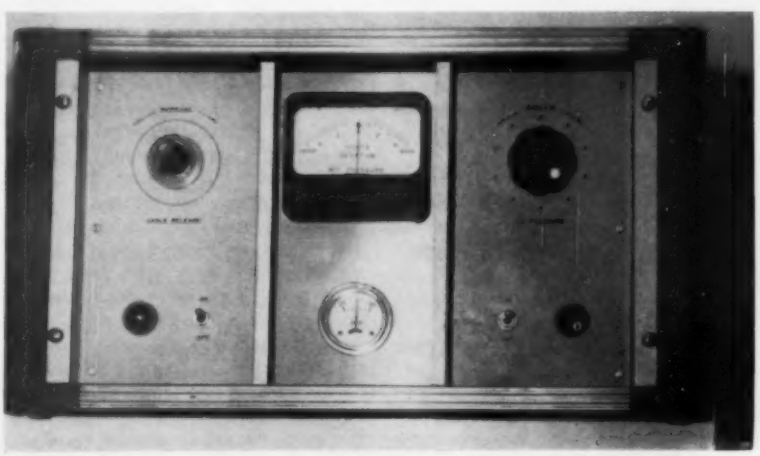
AUTOMATIC weight-control equipment has been applied to rotary drilling for a number of years. But it has not found general use because many of the devices have had high initial cost, large size and weight, and high maintenance. A new automatic weight-control device described here overcomes these objections because of its portability, ease of installation, accuracy, and low cost and low maintenance.

In the Rocky Mountain area this device has performed successfully in straight drilling, coring, and whipstocking operations. In several cases studied, automatic weight control has improved penetration rates from 7 to 50 per cent over manual weight control. Rock-bit savings have ranged from 29 to 50 per cent.

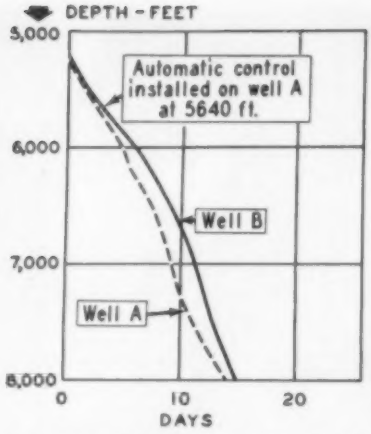
No consistent relationship between improvement in penetration rates and bit consumption has been found.

The new automatic weight-control device operates electronically, is low

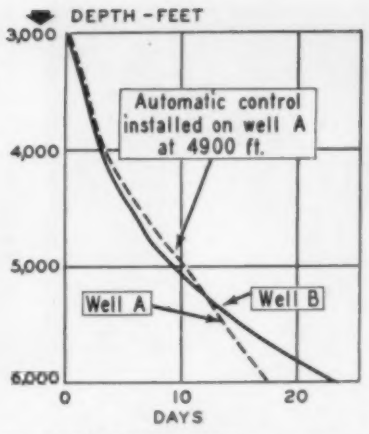
Authors Gresham and Ashby are with Mud Control Laboratories, Inc., Oklahoma City. Mecham and Ward are with Delta Drilling Co., in Denver, and Casper, Wyo. Paper presented at 1957 spring meeting of the Rocky Mountain District, A.P.I. Division of Production, Casper, Wyo., under the original title of "Automation in Drilling."



CONTROL BOX is electronic. It takes electric signals from weight sensor and changes them to electric commands to solenoid air valves. Fig. 3.



ONE DAY, 18 BITS were saved on this Wyoming well. Fig. 4.



TWELVE BITS, 7½ DAYS were saved on this Colorado well. Fig. 5.

in cost, light in weight, small in size, easily installed, and it has safety and alarm devices. It has a weight-sensing device (Fig. 2), a control mechanism (Fig. 3), and a line-releasing mechanism (Fig. 1). This compares to a man operating the rig.

Line releasing . . . In the mechanical system duplicating the task of the driller, the line-releasing device offers the greatest difficulty. The most direct approach to controlling line release is to use the existing brake rather than add bulk, weight, and cost in the form of an auxiliary braking device. Furthermore, to minimize rig modification the control should be through the existing brake handle.

Unfortunately, a perfectly smooth brake is impossible to find; so, in practice, the brake is assumed to have two reliable conditions, completely locked and completely free. The slip region is avoided where lopsided drums and worn linings would produce erratic operations. Under the "off" and "on" conditions, the amount of cable released will be a function of the tension in the line, the inertia of the system, and the time the brake is released. Controlling the time the brake is released determines the amount of line released. This concept of line release is called "pulsed brake operation."

To achieve this pulse operation of the brake a spring-loaded air cylinder is placed between the draw works brake and the floor of the rig (Fig. 1). When the cylinder is attached to the brake arm, there is sufficient spring tension to keep the brake in the locked-on position, except when line release is called for.

Weight control . . . The weight-sensing device (Fig. 2) presents the next problem. This weight indicator is conventional, in that it mounts on the dead line and translates tension in the line to useful information. It differs from other devices in that its weight information is electrical.

This weight information is supplied to the control unit which makes the decision as to whether the weight change is sufficient to warrant line release, or if the change is sufficient to set the alarm circuits into operation.

If line release is called for, the control unit sends a pulse of electrical energy to the air operating the air valves, causing a pulse of air to be supplied to the brake air cylinder. The duration of this pulse determines the amount of line that is released. This constitutes the pulsed operation of the brake.

The control unit waits approximately 1 second and makes another weight decision. It is necessary for this time to elapse in order that the new weight condition may be established in the line-supporting system and the weight information can reach the weight indicator.

If the weight information is such that still further releases are necessary to restore the original condition, then a second, third, and possibly more releases will be made until the original condition is restored. If the weight information fed to the control unit (Fig. 3) exceeds the safe operating limits within the equipment, the alarm circuits take over, sound the alarm horn, and release one of the air valves on the air unit. This released valve dumps any air that might be in the air cylinder, locks the draw-works brake on, and prevents any further air reaching the brake air cylinder.

Operating it . . . Next consider the operation of the automatic line-releasing device on a typical rig. The driller has manually made a connection and has gone to bottom, and picks up the desired drilling weight. He attaches the brake arm to the air cylinder. He then goes to the control unit and adjusts a knob until a deviation meter reads zero. This deviation is the desired drilling weight. He then sets an in-out switch to the "in" position.

When the weight in this system has changed enough to cause the deviation meter to read zero or just to the left of zero, line release is called for. The driller then adjusts the line-release control, which controls the time the brake is released.

If the driller wishes to add more drilling weight, he turns the weight-control knob to the desired weight condition. Line release will begin immediately and continue until the new weight condition is reached. Then the control will maintain this new drilling weight.

In the event the operator should improperly adjust the equipment or rig equipment failure should occur whereby the drilling weight would exceed the preset drilling weight by 3,000 lb., the alarm circuits would go into effect, preventing further line release and the driller would be signaled. If he should encounter a drilling break or the drill stem should twist off whereby the drilling weight would be lessened by 5,000 lb., the alarm circuit would again take over and he would be notified.

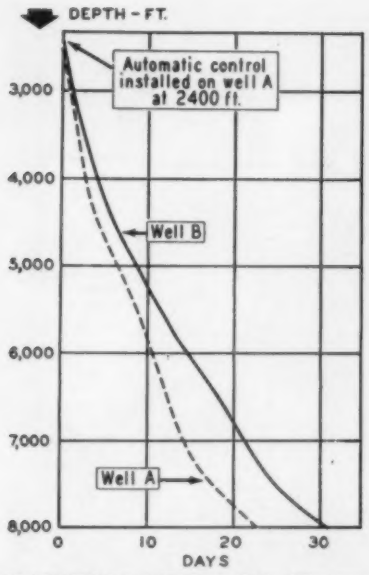
To make a connection or trip, he sets the in-out switch to the "out" position, removes the brake air cylinder from the brake arm, and operates the rig in the usual way.

Power for this equipment is supplied from a small generator mounted on either the rig motors or compound. This generator in turn keeps a battery charged. By using this power system, the operation of the equipment is not interrupted for several hours in the event of a power failure on the rig.

Rate limit . . . The equipment is able to release line to keep up with a drilling rate of 3 ft. per minute on an eight-line block. However, it is not recommended for use where penetration rate exceeds 1 ft. per minute. It is doubtful that weight control will be of any advantage to the operator in the higher penetration rates, where pump capacity rather than weight control is the predominant factor. The amount of drilling weight which can be maintained with this equipment is influenced by many factors. If the rig is in reasonable condition, it is possible to maintain a weight variation of 500 lb. or less at penetration of 1 ft. per minute or slower.

Field Results

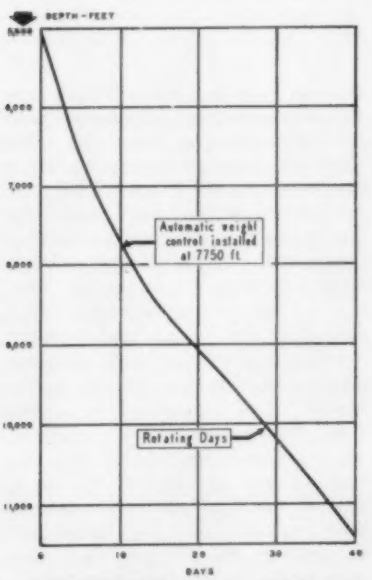
This study of wells drilled with the automatic weight control equipment



CLARKSFORK FIELD well in Montana required 9 days less and 20 fewer bits with automatic driller. Fig. 6.

compares results with manually controlled wells where the following factors were reasonably similar: proximity of locations, depth range, formations penetrated, similarity of formation dips, hole size, mud program, weight on bit, table speed, pump pressure, rig specifications. The "rotating progress" curves included on drilling charts provide ideal penetration-rate data uninfluenced by differences in contractor rig-operating efficiencies and trip times. These curves show actual time drilling on bottom.

Fig. 4 compares rotating progress between the depths of 5,200 ft. and



RATE SPEEDUP in lower part of this well resulted in straight-line penetration curve. Fig 7.

A lightweight, easily installed automatic weight-control device has speeded drilling and saved bits in the Rocky Mountain area. One driller found he could make 16 per cent more hole with it. However, the driller must still "stay at the brake" in order to select best drilling conditions.

8,000 ft. on two wells drilled in the Beaver Creek area, Fremont County, Wyoming. The automatic weight-control device was installed on Well A at depth of 5,640 ft. Well B drilled manually required 15 rotating days and 38 bits to penetrate 2,800 ft., whereas Well A required only 14 rotating days and 20 bits. A saving of 1 rotating day, or 6.7 per cent, and 18 bits, or 47.3 per cent, resulted.

Fig. 5 shows rotating progress of two wells drilled in Fort Collins field, Larimer County, Colorado. The automatic weight control was installed on Well A at 4,900 ft. At this point the rotating progress of Wells A and B were nearly identical. Below this depth, the manually drilled Well B continued a normal hyperbolic trend characteristic of penetration performance of other wells in this field. Well A, however, showed a complete reversal in trend and followed approximately a straight-line progress below 4,900 ft. This resulted in a saving of 7½ days (50 per cent) and 12 bits (50 per cent) in the 1,100 ft. interval compared.

Fig. 6 presents a comparison of rotating progress on two wells drilled in Clarksfork field, Carbon County, Montana. Automatic weight-control equipment was placed in operation on Well A at 2,400 ft. Well B was drilled with manual weight control throughout the 5,600-ft. interval studied. Well A required 9 days less rotating time, or a saving of 28.1 per cent, and 20 fewer bits were used, equivalent to a saving of 29.0 per cent in bit consumption.

Changes trend . . . Fig. 7 sets forth rotating progress over the interval 5,000 ft. to 11,450 ft. of a wildcat well drilled in the Green River basin, Sweetwater County, Wyoming. Automatic weight control was installed at 7,750 ft. This curve illustrates the same characteristic observed in Fig. 5, wherein the rotating progress on Well A assumed nearly a straight-line function after installation of automatic weight control.

Actually the rotating progress curve on Fig. 7 becomes slightly arched below 8,500-ft. depth. This feature is in distinct contrast to other deep tests drilled in the Green River basin where the rotating progress generally approximates a hyperbolic trend common in most rotary-drilled wells.

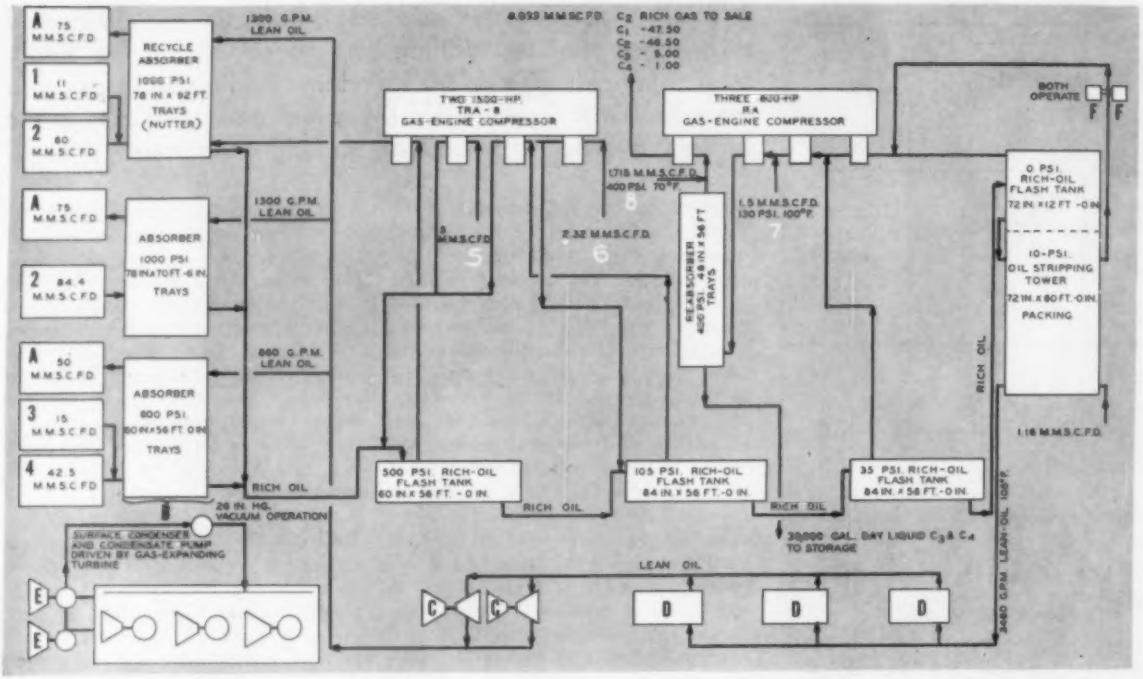
Detailed studies were instituted on this well to compare the penetration-rate performance by tours each day. One driller would use manual weight control, while the other two drillers made use of automatic weight control. All followed the same application of weight on bit, table speed, and pump pressure. The driller using manual weight control attained an improvement of some 16 per cent in penetration rate by switching to automatic weight control.

Driller conduct . . . The studies conducted on the well of Fig. 7 clearly point out the importance of properly instructing and familiarizing the drillers in the use of automatic weight-control equipment. The instrument does not think for the driller although it will faithfully and accurately follow his bidding. The driller must still constantly study the ditch samples, watch the properties of the drilling mud, and observe the geolograph chart toward the end of selecting proper table speed, pump pressure, and weight on the bit to achieve highest penetration rate and bit performance as differences in formation are encountered.

Although automatic weight control does relieve the driller from constantly holding the brake, the driller making the most hole with the assistance of automatic weight control is the one who "stays at the brake" and gives close attention to the constantly varying factors enumerated.

The performance of certain wells using automatic weight control in the Big Horn basin and others drilled along the front of the mountain range in Sublette County, Wyoming, were studied with particular interest because of the crooked-hole problems presented by the dip of the formations and possible faulting penetrated. Comparative rotating curves for nearby and comparable wells drilled with manual weight control are not available at this time. But from the evidence at hand both penetration rates and bit performances show improvement over wells drilled manually under such adverse conditions.

Data in the use of automatic vs. manual weight control while coring are not presently available in sufficient amount to present factual statistics. However, automatic weight control has a definite application in coring. **End.**



FLOW DIAGRAM of La Gloria's C_2-C_3 extraction unit. In this process scheme there is no dehydration, no refrigeration, or heating. Only process cooling required is for gas from compressors and lean oil from booster pumps. The main economic consideration is that the high-pressure plant produces its own absorption oil. Fig. 1.

New absorption system leads to . . .

High Ethane Recovery, Better Efficiency

By Homer C. Givens

A NEW absorption system for high ethane recovery is being put into operation at the Falfurrias, Tex., natural-gasoline plant of La Gloria Oil & Gas Co.

The system will be used to help provide a product gas of about 53 per cent ethane and 47 per cent methane. The company has received several inquiries for gas with an ethane concentration of 35 per cent or more.

The new system uses conventional absorption and related equipment, but the applications are somewhat unusual. It was selected after refrigerated systems were ruled out as being too costly.

How it works . . . Fig. 1 shows a simplified flow sheet of the new system. The few coolers, the cooling tower, and some minor appurtenances are not shown.

Author is plant manager, Falfurrias, Tex., plant, La Gloria Oil & Gas Co. Paper presented at Texas A. & I. College short course on gas technology, Kingsville, Tex., 1957.

Only gas to sales will be passed through the system. There are three absorbers, one at 600 psi. and the other two at 1,000 psi. The absorption-oil rate will be approximately 30 gal. per M.c.f. of gas. One of the 1,000-psi. absorbers is taller than the other. These absorbers are equipped with Nutter trays.

There will be 75 M.M.s.c.f.d. residue gas from each of the 1,000-psi. absorbers and 50 M.M.c.f. from the 600-psi. unit. Feed gas to the 600-psi. absorber comes from the 600-psi. pipeline absorber and from the 300-psi. casing-head absorber, after compression to 600 psi.

Rich oil . . . The rich oil from the absorber goes to a 500-psi. flash tank and the flash vapors are recompressed to 1,000 psi. and enter the taller 1,000-psi. absorber four trays below the main stream of gas entering. In this section of four trays the ethane and propane in the recompressed vapors exchange places almost mole for mole with methane in the oil. Thus this section is a deethanizer, and a reabsorber for ethane and propane.

From the 500-psi. flash tank the oil flows to a 105-psi. flash tank. The 105-psi. flash vapors and the residue from the existing 250-psi. reabsorbers are compressed to 500 psi. and mix without cooling with the oil to the 500-psi. flash tank. This releases more methane and less ethane and propane in the 500-psi. flash tank than would be the case normally.

Three-fourths of the residue gas from the existing low-pressure reab-

FEED STREAMS
(In per cent)

1. Casing-head 1,000-psi. Panapak absorber:

C_1	94.00
C_2	4.80
C_3	0.90
C_{4+}	0.30

2. From hp. plant 1,150-psi. absorbers:

C_1	95.75
C_2	3.30
C_3	0.75
C_4	0.20

3. 300-psi. casing-head comp. to 600 psi.:

C_1	94.00
C_2	4.80
C_3	0.90
C_4	0.30

4. From hp. plant 600-psi. absorber:

C_1	94.50
C_2	4.10
C_3	1.20
C_4	0.20

VARIOUS FEED STREAMS which come into the new absorption systems have analyses as shown in this table.

5. From hp. plant 250-psi. reabsorber:

C_1	90.00
C_2	8.10
C_3	1.80
C_4	0.10

6. From hp. plant 70-psi. reabsorber:

C_1	79.00
C_2	16.35
C_3	4.12
C_4	0.53

7. From casing-head-plant reabsorber:

C_1	74.50
C_2	16.30
C_3	8.20
C_4	1.00

8. From deethanizer overhead:

C_1	3.98
C_2	88.00
C_3	7.85
C_4	0.17

(A) Residue from absorbers:

C_1	97.00
C_2	2.70
C_3	0.20
C_4	0.10

(B) Hydraulic - turbine - driven compressor to compress casing-head gas from 300 to 600-psi. C_2 absorber 250 b.hp. compressing 5.5 M.M.s.c.f. day. Using 1,275 g.p.m. rich oil from 1,000-psi. absorber to 500 - psi. flash tank.

(B) Hydraulic - turbine - driven compressor compressing 7 M.M.s.c.f. day gas from 600 to 1,150 psi. 1,275-g.p.m. rich oil from 1,000-psi. recycle absorber to 500-psi. flash tank. 250 b.hp. Estimated cost $75.00 per b.hp. installed and operating.

5,400-b.hp. gas engines.

325-b.hp. gas-expanding turbines.

2,850-b.hp. 7-psig. exhaust steam turbine.

300-b.hp. rich-oil hydraulic turbines.

150-b.hp. rich-oil hydraulic motors.

(C) Two seven-stage centrifugal pumps for lean oil to absorbers. 1,425 b.hp. low-pressure steam turbine driving each pump. 7 psig. exhaust-steam inlet. Exhaust at 26 in. vacuum. 40,000 lb. per hour each turbine. Estimated H_2O water saving 12 g.p.m.

(D) Three lean - oil booster pumps. 2 operate, 1 spare. 2 operating will be driven by hydraulic motors each developing 76 b.hp. using 425 g.p.m. rich oil from 500 to 105 psi. Spare steam turbine for startup.

(E) Circulating H_2O pumps (1 operating, 1 spare) and 3 fans for cooling tower. Gas-expanding turbines driving. H_2O pumps 200 b.hp. and fans 40 b.hp. 11 M.M.s.c.f. day fuel gas from 300 to 50 psi. Slightly modified steam turbines used. Gas will be heated by condensing exhaust steam. Condensing H_2O saving 3 g.p.m.

(F) Two rotary vacuum compressors. Driven by 150-hp. hydraulic turbines (modified centrifugal pumps). Rich oil from 500 to 105 psi. 1,000 g.p.m. required by each turbine.

sorber is compressed to 105 psi. and mixes with the oil from the 500-psi. flash tank to the 105-psi. flash tank. This residue gas is quite rich in ethane and is entered here for the same reason as gas is entered in the oil to the 500-psi. flash tank.

From the 105-psi. flash tank the oil flows in succession to a 35-psi. flash tank, a 0-psig. flash tank, and a 20-in. Hg vacuum stripping tower. The other one-quarter of the low-pressure reabsorber residue gas enters the stripping tower as the stripping medium.

Vapor processing . . . Rotary compressors maintain the vacuum on the stripping tower and discharge to the flash vapors from the 0-psig. flash tank. These vapors are compressed to 35-psi., mix with the 35-psi. flash vapors and are compressed to 125 psi.

The residue gas from the casing-head - plant reabsorber enters the stream at this point and then the combined streams are compressed to 400 psi. and flow to the 400-psi. reabsorber.

In the 400-psi. reabsorber, propane and butane are absorbed by a stream of absorption oil from the regular high-pressure plant, and are processed in the high-pressure plant. This is the only place the existing plant facilities are used in processing any of the products extracted in the new equipment.

How the system works . . .

Success of this unusual absorption is due mainly to two steps in the operation:

1. Vapors from the high-pressure flash drum, immediately following the absorption step, are recompressed to absorber pressure and enter the taller high-pressure absorber four trays below the main gas stream. In this four-tray section, ethane and propane in the recompressed vapors exchange places almost mole for mole with methane in the oil.

2. Vapors from each lower-pressure flash drum are recompressed and joined with the rich oil entering that flash drum. This provides for additional enrichment of the absorbed gas in the oil.

The deethanizer overhead and the residue from the 400-psi. reabsorber combine and are compressed to 1,000 psi. which is delivery pressure for the ethane-rich gas.

Power Conservation

Some very interesting features of power conservation are incorporated in the design of the plant. The greatest single amount of power conservation will be the use of approximately 80,000 lb. per hour of exhaust steam to drive two 1,425-hp. steam turbines.

The exhaust steam at the throttle valve will be at 7 psig. and the condenser will operate at 26-in. Hg vacuum. We have been condensing this steam at 5 psig. and fouling up our condensers. So we will be saving power, maintenance, labor, and water.

The rotary compressors will be driven by hydraulic turbines, using as a power source, oil flowing from the 500-psi. flash tank to the 105-psi. flash tank. The lean-oil booster pumps will be driven by a positive-displacement hydraulic motor using the same source of oil as power. Each of these two motors will develop 76 hp.

The cooling-tower circulating water pumps, cooling-tower fans, and the surface - condenser condensate pump will be driven by slightly modified steam turbines powered by 11.5 M.M.c.f. of fuel gas expanding from 300 to 50 psi. The gas will be heated to 180° F. by exhaust steam before expanding through the turbines. The total horsepower of these turbines will be 350.

Plans are being studied at the present time to use the oil from the two 1,000-psi. absorbers to develop approximately 700 hp. to drive compressors. These compressors will compress gas from 300 to 600 psi. and will cost about $70.00 per horsepower, ready to operate. **End.**

Plastic Piping—8 Years Later

First used in oil production in 1949, this product has come far

This article is a guide to intelligent use of plastic pipe in oil-field operations. Discussed are three types of currently available materials—extruded plastics, glass-reinforced plastics, and plastic coatings. Preferred use for each type is shown based on maintenance cost, property deterioration in service, temperature-strength characteristics, and creep characteristics.

By W. D. Greathouse and R. L. McGlasson

PLASTICS have come of age in oil-field operations. Advances in material properties and engineering know-how make possible intelligent use of plastics in combating corrosion and paraffin deposition. The following generalizations can be made for plastics currently available for production use:

- Polyvinyl chloride (PVC) is stronger than other extruded plastics and can be used where strength is required.
- Cellulose acetate butyrate (CAB) reduces paraffin deposition, but will not control "gunk accumulation" in low areas or at low flow velocity. Some of the other plastics undoubtedly have the same effect.

Authors are with Continental Oil Co., Ponca City, Okla. Paper presented at spring meeting of Mid-Continent district, A.P.I. Division of Production, Tulsa, under the original title, "Progress in Plastics for Petroleum-Production Piping."

- Fibercasts are justified only when extruded plastics cannot be used.
- Plastic coatings are more successful when baked on by the manufacturer.

Recent changes . . . Since the introduction of plastics into the role of petroleum-production piping in 1949, a great amount of progress has been made. The early uses of plastic pipe were characterized by inconsistent material quality, little or no engineering data availability, and no engineering or installment experience. The present status of plastics shows a decided improvement in each of these three aspects of their use.

This article emphasizes the progress that has been made. Known characteristics of plastic materials in each of three categories—extruded plastics, fibercast plastics, and plastic coatings—are discussed in detail. The physical-property data, creep data, deterioration data, and performance cost information presented in this article and listed in the references represent in themselves a decided improvement. There are still some areas of confusion concerning properties of materials, and these points are discussed.

Some rules for successful engineering and installation practice are presented. The significance of the effective tensile strength in successful engineering of plastics is described.

PRODUCING

Extruded Plastics

This discussion of extruded plastics is limited to those plastics now being used for petroleum-production piping as lead-line materials. This includes cellulose acetate butyrate, styrene-butadiene-acrylonitrile copolymer, and unplasticized polyvinyl chloride—both pure and diluted with GRS rubber. These materials will be referred to in the order listed as CAB, kralastics, PVC Type 1 normal impact, and PVC Type 2 high impact.

In Table 1 are mechanical and physical properties of a variety of engineering materials. The properties presented for plastic are for those materials used for petroleum-production piping.

Physical properties for given types of plastics depend to a great extent

Table 1—Physical and Mechanical Properties of Engineering

Material—	Specific gravity	Tensile strength (psi.)	Effect. tensile strength (psi.)	Flexural strength (psi.)	Compres. strength (psi.)	Impact strength (IZOD) (ft.-lb. per in.)	Mod. of elasticity (10^5 psi.)	Thermal expansion (in./in. per °F. × 10^5)
CAB	1.20	4,500	1,000	6,000	4,500	1.8	1.32	9.8
Fibercast, epoxy	.....	*40,000	*15,000	.....	.....	.....	.....	0.7
Fibercast, polyester	1.55	*40,000	*7,500	38,000	22,000	15.0	16.0	1.0
Fiber and tar	.....	2,500	.....	.....	.....	.....	.....	.....
Fiber and creosote (Orangeburg)	.....	3,500	.....	.....	.....	.....	.....	.....
Furan, asbestos filled	1.75	4,000	.....	6,500	11,000	0.5	1.5	1.8
Graphite, impervious	1.9	2,500	.....	5,000	9,000	4.0	0.6	5.5
Kralastic	1.06	4,700	2,000	8,500	7,500	10-15	2.3	3.4
Polyethylene	0.92-1.00	1,000	375	1,700	.....	16.0	0.13	10.0
PVC, unplasticized	.....	.....	.....	.....	.....	.....	.....	.....
Type 1, normal impact	1.38	7,000	2,600	14,500	9,600	0.8	0.5	2.9
Type 2, high impact	1.35	6,000	2,000	11,500	8,600	15.0	2.5	5.5
Rubber, hard	1.24	7,170	.....	11,300	10,000	0.4	3.0	4.0
Steel	7.90	56,000	28,000	.....	28,000	35.0	300.0	0.7
Tetrafluoroethylene (Teflon)	2.20	1,800	.....	.....	1,700	4.0	0.5	5.5
Vinylidene chloride	1.70	5,000	.....	16,000	8,000	1.0	8.8	11.0

*Properties given here represent capabilities of these materials and not the properties at given grades of pipe by given manufacturers. should be used. Due to the nonhomogeneous nature of the fibercast materials, it is not possible to quote strengths of these materials that the quantity and distribution of the reinforcing glass and different relative ratios of glass to resin in a product results in different strengths.

on the purpose for which the plastic was fabricated. Not all tabulations of such data can be applied to petroleum-production piping. For example, in some recent papers,[1 2] tensile strengths of 9,000 psi. are listed for PVC. PVC's of this strength are not encountered in petroleum - production piping. Thus Table 1 represents a substantial progress in data availability.

Deterioration tests . . . Tables 2 and 3 give the results of property-deterioration studies applicable to petroleum-production piping. The media used in these laboratory tests are relevant to petroleum - production applications. The field test data are actual "in service" results. One of the avenues along which progress is needed is the accumulation of more data of this type.

The temperature vs. strength data given in Figs. 1 through 6 are representative of petroleum-production piping materials. They are presented in terms of "per cent change in strength" in order to be easily applied by the engineer to the room-temperature properties presented in Table 1.

Figs. 7 and 8 are typical creep curves on CAB and PVC, Type 1. From such curves effective tensile strength of plastic materials is determined. Without this plastics "yield point," many early-day applications of plastics met with failure, simply because the application was outside the real strength limitations of the material.

We have not yet obtained such data on the kralastic materials, and as a result have had to estimate the effective tensile strength for this material. The availability of creep data on the CAB and PVC materials represents a very essential element of progress.

CAB . . . Cellulose acetate butyrate was one of the earliest rigid plastics to be used for petroleum-production piping. The material is essentially the same today as it was at that time. Its tensile strength and effective strength are both lower than the other extruded plastics. Its temperature-strength properties are correspondingly low. As can be seen from Tables 2 and 3, it is afflicted with some 20 per cent reduction in strength upon being wet by either aqueous or hydrocarbon media.

On the other side of the ledger, however, it is a material of very consistent properties, with very little variability from one batch to the next. It is the only plastic that we have been able to definitely determine to inhibit paraffin deposition on its walls. The decrease in strength it suffers on initial exposure to brines and crude oils does not progress with time (see Tables 2 and 3).

Kralastics . . . The kralastic copolymer plastic is another of the "early birds" in petroleum-production piping. Here again there has been little change in this product since it was first introduced.

One of the first problems with this material was its acceleration of paraffin deposition in the lines. It also suffers from considerable product variability. Different products tested in our laboratory have shown as much as 25 per cent difference in mechanical properties.

Deterioration tests (see Tables 2 and 3) show considerable reduction in strength with time upon exposure to petroleum-production environments. No data have been accumulated by which this deterioration can be extrapolated to longer than 18 months. The lack of creep data on this material also makes accurate determination of its effective tensile strength impossible.

Properties of this material show that its tensile strength is decidedly higher than CAB; comparable to PVC, Type 2; and lower than PVC, Type 1. Its strength is less affected by changes in temperature than either CAB or either of the PVC's. Estimates we have made of its effective tensile strength place it as superior to CAB; equiv-

TABLE 2—STRENGTH DETERIORATION OF EXTRUDED PLASTIC PIPE MATERIALS EXPOSED TO PREVIOUSLY LISTED CONDITIONS

Material—	Per cent decrease in strength after 30-day exposure at 120° F.				
	H_2O	3% NaCl	3% HCl	3% NaOH	Slick Wilcox crude
CAB	—17 to —23	—12	—14	—17	5
Kralastic—A	0	0	0	0	3
Kralastic—B	0	0	0	0	6
PVC, Type 2	0	0	0	0	0

Determinations were made on tensile specimens in wet condition. Note 5 per cent reduction for CAB when sample is wet with crude when pulled. No effect obtained on dried sample after 18 months' exposure (see Table 3). Not considered deterioration effect, but rather a wetting effect. Effect of water or brine on CAB much more pronounced but this again is considered a wetting rather than an aging effect. This effect probably occurs upon installation but is not expected to increase with time.

TABLE 3—STRENGTH DETERIORATION OF EXTRUDED PLASTIC PIPE AFTER USE FOR 18 MONTHS IN WELL LEAD LINES AS LISTED

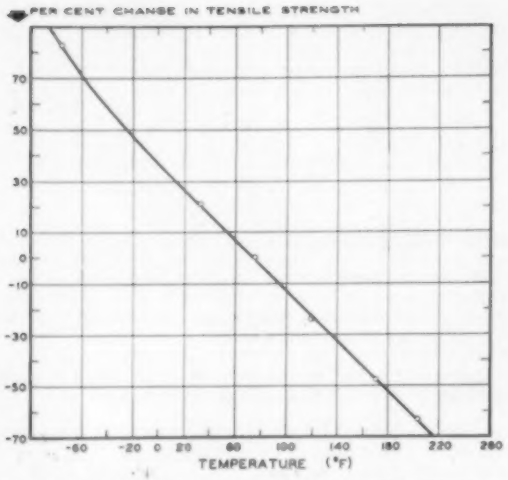
Material—	Test sample condition*	Well name	Production	Per cent change in strength
CAB	Dry	3 William A. Ploog	Arbuckle	0
CAB	Dry	2 R. P. Devine	Topeka	0
CAB	Wet	1 F. A. Hetzke "A"	Arbuckle	—24
Kralastic	Dry	6 J. N. Diskey	Kansas City	—15
Kralastic	Dry	6 C. E. Vine "A"	Topeka	—19
Kralastic	Dry	Unknown	Arbuckle	—19

*This refers to condition of test sample at the time it was pulled. In all cases but one, the samples as received for testing had dried out during shipment. The sample described as "wet" was shipped in container of well fluid and was pulled while still wet with fluid. Compare to Table 2 to see effect of wetting by water and/or crude.

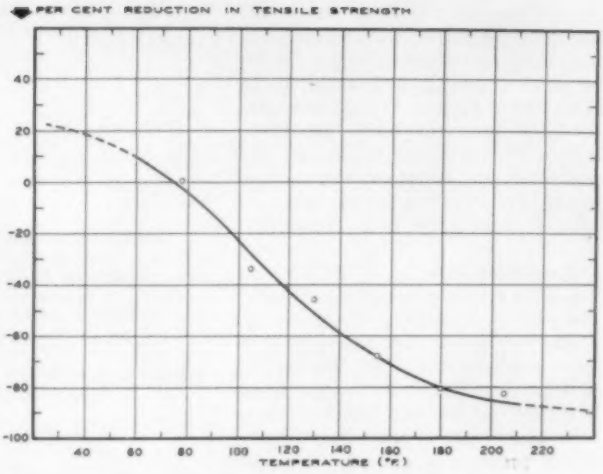
Plastic Materials (at or Near 76° F.)

Thermal conduct. (cal./cc./°C. × 10^{-4})	Heat distortion temp. (°F.)	Max. useful temp. (°F.)	Min. useful temp. (°F.)	Effect of sunlight	Water absorption (per cent in 24 hr.)	Dielectric strength (volts/mil)	Burning rate
4.8	116-215	120	—10	Slight (black)	2.1	350	Slow
....	....	260	....	....	....	....	....
1.5	190	150	—90	Nil	0.3	500	Self ext.
....	....	....	....	....	....	....	....
....	....	....	....	....	....	....	....
0.6	260	250	—40	Nil	0.1	....	Slow
86.0	....	340	20	Nil	....	....	Nil
3.0	190	140	—20	Slight	0.3	325	Slow
8.0	100	120	—50	Moderate	0.01	460	Slow
....	....	....	....	....	....	....	....
5.0	165	140	20	Nil	0.06	1,413	Self ext.
4.5	155	140	10	Slight	0.07	1,085	Self ext.
3.0	275	120	10	Moderate	0.02	470	Medium
400.0	1,000	600	—50	Nil	0.00	0.01	Nil
6.0	270	450	—60	Nil	0.00	480	Nil
2.2	150	150	10	Slight	0.10	350	Self ext.

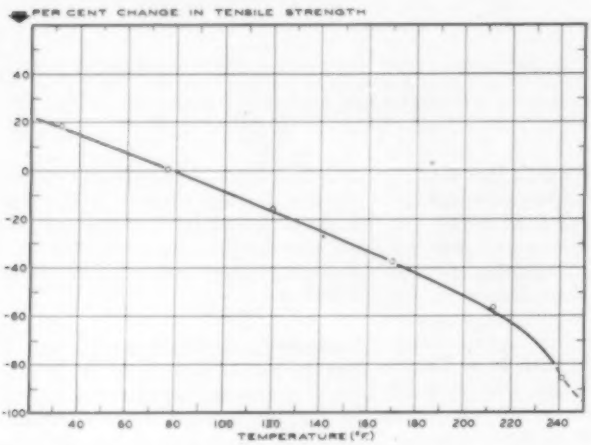
When engineering fibercast installations, the manufacturers' data on the specific product are applicable to all sizes and thicknesses of pipe. The strength is primarily a function of



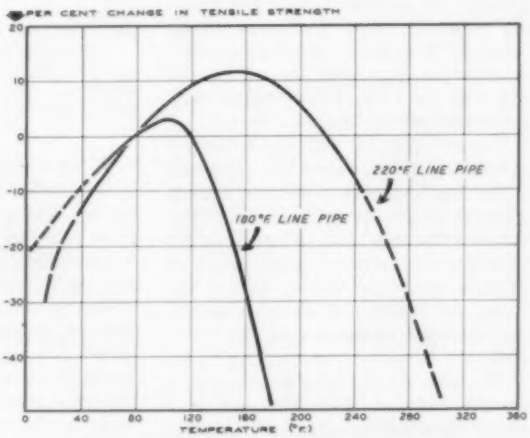
CELLULOSE ACETATE BUTYRATE shows this change in strength with temperature. Base is strength at 76° F. Fig. 1.



POLYESTER FIBERCAST changes in strength with temperature. Base strength at 78° F. is 7,982 psi. Fig. 2.



KRALASTIC-TYPE pipe also has reduced strength with increased temperature. Fig. 3.



EPOXY FIBERCAST strength rises with increased temperature then drops sharply. Fig. 4.

alent to PVC, Type 2; and inferior to PVC, Type 1.

PVC, Type 1, normal impact . . . Since its introduction, the Type 1 pure PVC has been improved considerably. Some of the early products were afflicted with a glasslike brittleness and resulted in expensive and unsatisfactory service (Table 4). Compounding and extruding of pure PVC demanded controls not necessary for the other extruded plastics.

The material itself has a limited thermal life. Recognition of this characteristic by compounders and extruders now manufacturing pure PVC pipe has resulted in elimination of the brittleness problem in present-day products.

Present-day Type 1, normal-impact PVC represents the best of the extruded plastics in terms of strength. Its tensile strength, effective tensile strength, and deterioration characteristics make it superior in all these respects to the other extruded plastics. Its impact strength, although somewhat lower than the kralastics and Type 2, high-impact PVC, is comparable to CAB and certainly sufficient for most lead-line applications.

Our tests of its paraffin-deposition characteristics have not been completed. Some suppliers of this material assure one that it resists paraffin and scale deposition. Data we have obtained to date are inconclusive on this point.

PVC, Type 2, high impact . . . The Type 2 PVC was originally introduced to combat the brittleness problem of the early pure PVC's mentioned previously. It has since been retained because of its good impact characteristics.

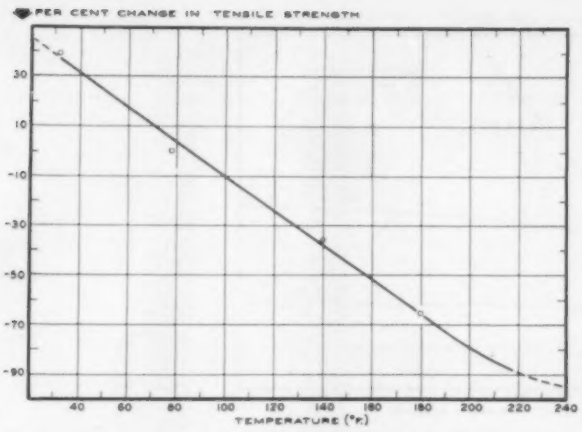
Although the Type 2 PVC has a very good impact strength, it is inferior in other respects to the Type 1. The 3 per cent rubber addition used in compounding this material sacrifices the high tensile and high effective tensile for better impact characteristics. Because of its good deterioration properties (see Tables 2 and 3), it is still superior strengthwise to both CAB and the kralastics. No serious product variability has been noted in this material.

The PVC's have shown more progress since their introduction into the oil industry than any of the other extruded plastics. Their widespread use is still somewhat restricted because of the unfortunate experiences people had with some of the earlier products. The extensive, successful use of the PVC's in Europe is indicative of their widespread applicability.

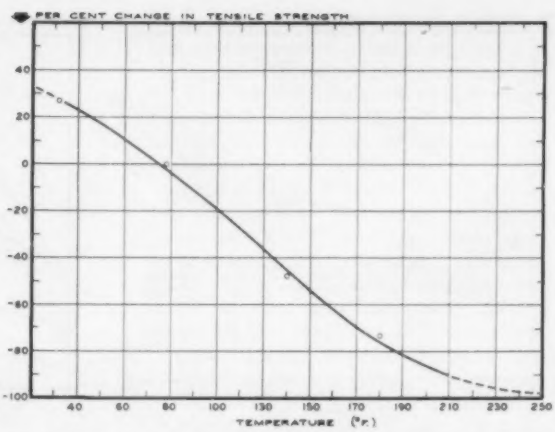
Fibercast Plastics*

The technology of the fibercasts as piping has decidedly improved since

*Although fibercast is in reality a proprietary name, we shall use this shorter term to refer to glass-reinforced plastics in this paper.



PVC, TYPE 1 strength changes uniformly with temperature from a 78° F. tensile strength of 7,000 psi. Fig. 5.



PVC, TYPE 2 strength decreases with temperature slightly more than Type 1. Strength at 78° F. is 6,000 psi. Fig. 6.

they were first introduced. A number of papers[3] and N.A.C.E. technical reports[4] have defined some of the significant characteristics of these materials. Most of the early problems encountered in using the fibercasts resulted from a failure to recognize that the "effective tensile strength" was the important physical property in design engineering for these materials rather than the substantially higher "tensile strength."

Polyester fibercasts . . . The first fibercast materials used in petroleum-production piping were the polyesters. Many of those earlier products were placed on the market without sufficient laboratory and field testing. Insufficient quality control often accompanied the manufacture of the product.

Much of the experience with these materials was as salt-water-disposal-well tubing, where their high cost was justifiable. Many failures occurred, although the design loads were well below what was thought to be the limiting strength of the materials. Laboratory studies of the material showed that the material failed in time at stresses substantially lower than listed tensile strengths. Recognition of the fact that the effective tensile strength of these materials is decidedly lower than the actual tensile strength (see Table 1 and Fig. 9) probably represents the major element of progress made with respect to the polyester fibercasts since their introduction.

The present status of the polyester fibercasts as petroleum-production piping is not easy to define. There are quite a number of companies doing development work on fibercast piping for petroleum-production piping. Much of this work is directed toward developing and evaluating resins. From data available on products being commercially produced at the present, it would appear that the polyesters will be fast displaced from the oil-production piping market by epoxy-type materials.

Epoxy fibercasts . . . Once the existence and importance of the effective tensile strength of the fibercast materials were established, it then became possible to carry out product-development work with this in mind. At present the epoxy and modified phenolic-epoxy resins provide the highest effective tensile strengths. The only such product receiving widespread commercial distribution at the present time employs a straight epoxy resin.

The epoxy fibercasts represent a piping-strength level quite above the strongest of the extruded plastics (see Fig. 9). Its relatively high cost, however, restricts its use to applications where extruded plastics cannot be used. This excludes a substantial percentage of the lead-line applications.

Sour-brine test . . . One field test of an epoxy fibercast and a modified phenolic-epoxy fibercast as high-pressure line materials was conducted. Joints of both these materials were installed in a water-flood injection line carrying produced salt water containing H_2S. The line operates at 550-psig. pressure. Satisfactory results were obtained for approximately a year's service on the epoxy fibercast.

The modified phenolic-epoxy pipe tested was internally coated with a vinyl resin which blistered after some 9 months' service. This latter joint was considered unsatisfactory for sulfide service. Once the integrity of the resin-covered internal surface is destroyed, the "wicking" of liquid around the exposed glass fibers can be expected to result in rapid failure.

The straight epoxy-pipe tested did not have a second resin coating internally, but had a substantial thickness of excess epoxy resin covering the glass fibers inside the pipe. This test indicated that the use of a secondary coating, especially vinyl, will not provide the necessary coverage of the glass fibers.

Two strings of a straight epoxy fibercast are being tested as salt-water-disposal tubing. These tests have been going 6 months and satisfactory service has been obtained to date.

From the results of tests to date, it appears that this epoxy fibercast represents a big improvement over earlier fibercast products. It can probably be expected to fulfill at least some of the needs of the industry for corrosion-resistant piping. Its high cost does restrict its economical application to many problems.

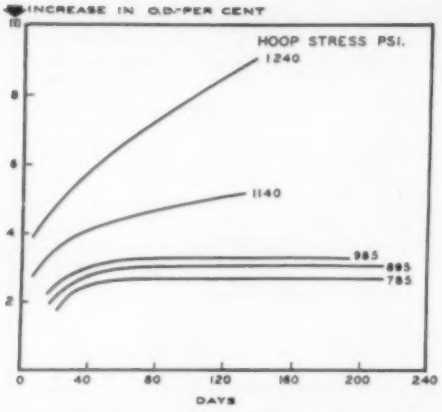
Plastic Coatings

The use of plastic-coated steel pipe for corrosion protection is a relatively new innovation in the oil-production business. Most of the progress that has been made in this field has been the evaluation of different coatings and different application methods. This evaluation work is far from complete, and more study in this direction is needed.

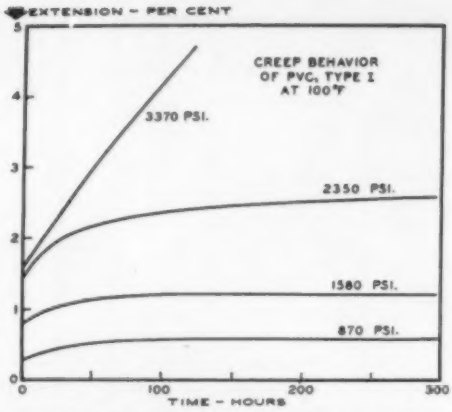
One of the corrosion problems which has been attacked by use of coatings has been the handling of produced waters containing H_2S. The laboratory and field tests reported here have been made relative to this problem. Tables 5 and 6 record the results of these studies, both in terms of coating types and application methods. Summarizing these data we find the following set of rules to be applicable to sour-brine systems:

1. Under no circumstances should vinyl coatings be used for sour salt-water transmission. Vinyl coatings are permeable to H_2S and, in systems containing H_2S, will blister and peel.

2. Because of inconsistent results



CREEP CURVES for CAB show how effective tensile strength is found. Above about 1,000 psi. hoop stress, this pipe will fail after a period of time. Fig. 7.



EFFECTIVE STRENGTH of this PVC, Type 1 pipe is about 2,300 psi. at 100° F. Stresses given are hoop stresses. Effective tensile strength must be used in design. Fig. 8.

obtained, paint-on, catalytic-cured, field-applied coatings are to be avoided unless the application is carefully supervised to insure effective, holiday-free application on a properly prepared surface. A surface is considered to be properly prepared when it has been degreased with alkaline degreasing agents, pickled for loosening mill scale and foreign metallic particles, and sandblasted and cleaned.

3. Paint-on catalytic cured phenolics should not be used for transmission of sour brines.

4. Factory-applied, baked-on, phenolic coatings have given consistently satisfactory service in sour-brine applications for periods of 3 years to date and, for this reason, are recommended for this application.

Epoxy tests . . . This evaluation of plastic coatings for sulfide systems represents only one step in a direction which certainly needs further work. Tests are now being made of baked-on epoxy and phenolic-epoxy coatings for both line transmission and salt-water-disposal-well tubing in sour systems. Tests on baked-on phenolic coatings for salt-water-disposal tubing are also being conducted. None of these installations have been in service over 6 months; and, for this reason, no significant results have yet been obtained. A 3-month examination of one string of salt-water-disposal tubing coated with a baked-on phenolic showed it to be in good condition. This was in a well where a vinyl coating was a complete failure within 9 months.

Results obtained with plastic coatings thus far indicate that they should be used only where straight plastics cannot be used because of strength requirements. There are many places where the application of plastic coatings must be carefully controlled in order to insure success. The major use of plastic coatings in sulfide services should be for applications outside the limits of the extruded plastics. Most of such applications are within the range of capabilities of fibercast materials now available.

Assuming the fibercast materials do not exhibit weaknesses after prolonged times of testing, then the choice between fibercasts and plastic coatings for these applications resolves itself to a problem of straight economics. Long-time maintenance information on coatings is needed for this evaluation.

TABLE 4—REPAIR COST INFORMATION ON SEVERAL MATERIALS USED AS LEAD LINES IN A CORROSIVE POOL IN KANSAS WHERE LINE PLUGGING BY THE "GUNK ACCUMULATION" MECHANISM IS A PROBLEM

(1) Type	(2) Footage	(3) Number of lines	(4) Number of repairs	(5) Cost of repairs	(6) Repairs per line (4) ÷ (3)	(7) Cumulative service (footage × mo. serv.)	(8) Relative cost of repairs (5) ÷ (7)
CAB	8,798	9	146	$5,584	16.2	393,081	1.42
Kralastics	3,073	3	37	1,394	12.5	160,076	0.87
PVC,* Type 2	1,107	1	0	0	0.0	16,605	0.00
Steel†	2,767	3	7	260	2.3	167,502	0.16
PVC,‡ (Early)	1,334	2	17	706	8.5	27,635	2.55

*This line was installed in a well severely afflicted with failures when using CAB. For this reason it is considered a significant example although the footage is low. †The low values obtained for steel here can be misleading if the increase of failure rate with time is not considered. ‡This line was one of the poor PVC products produced early in the history of these materials and as such is not considered typical of present-day products.

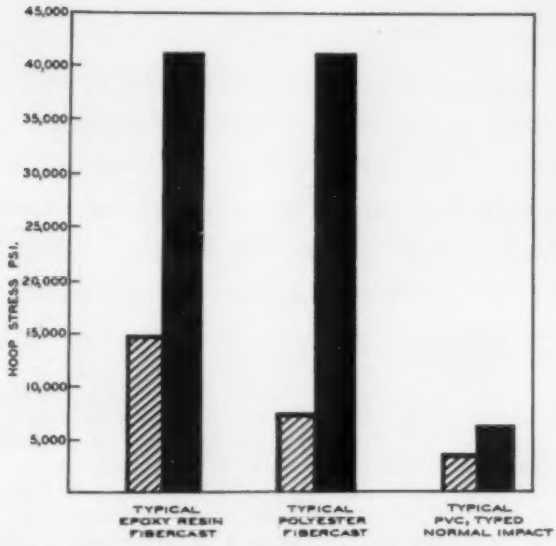
Engineering Design

When plastics were first introduced into the petroleum-production business, some of the problems resulted from lack of engineering understanding of the materials. With the data available today, many of the problems now are traceable to lack of satisfactory engineering design or poor installation techniques. A previous A.P.I. paper[5] has covered many aspects of the practical problems in using plastics. In this article, only a few aspects of these problems will be discussed.

Successful plastics engineering demands the development by the engineer of a practical engineering philosophy applicable to plastics. Engineering is an exact science which follows essentially the same rules, regardless of the material involved. The practical engineer normally develops, either consciously or unconsciously, some time-saving short cuts when using materials with which there exists considerable familiarity. Steel is such a material of familiarity.

A production engineer preparing to lay a pumping-well flow line of steel would give only token consideration to its pressure-handling capabilities. He has learned that a standard steel line pipe will handle his transmission problem over quite a wide range of pressures and temperatures, excluding unusual circumstances. Many mistakes result from applying this "steel" philosophy to engineering with plastics. Probably the most significant difference between piping with steel and piping with plastics is that with plastics the engineer must know the requirements of the application.

There are essentially only two problems for which the engineer should



EFFECTIVE STRENGTHS of plastic pipe, represented by cross-hatched bars, are much less than short-time strengths (solid bars). Present-day epoxy fibercasts are clearly superior to polyester fibercasts. Fig. 9.

consider the use of plastics—corrosion and/or paraffin deposition. The significant aspects of designing for each of these problems are considered in the next few paragraphs. The importance of designing to fit the problem is pointed out in the section on maintenance costs.

Designing for corrosion . . . If the only reason one is using plastics is to solve a line-pipe corrosion problem, the only considerations are strength and cost. The engineer must select the type and weight of plastic pipe, which will give him the needed pressure-carrying capacity at the least cost. The first step in doing this is to determine the smallest sized pipe that will adequately handle the volume requirements. This can be accomplished by using the Hazen and Williams formula given in engineering handbooks[6] using a "C" factor of 140 for all of the plastics.

The next step is to determine accurately the pressures and temperatures involved. If it is an existing installation, pressure determinations should be made using a recording pressure gage; and the pressures over an extended time should be obtained. An actual fluid-temperature measurement should be made. If it is not possible to determine requirements in this manner, the pressure requirements based on computations should take into account every possible source of pressure increase anticipated.

After the maximum anticipated pressure is determined, the engineer is ready to apply a safety factor. A safety factor of two is probably adequate. The safety factor must be increased corresponding to the element of uncertainty of the estimations involved.

Pressure capacity . . . The selection of the plastic for the job becomes one of fitting the plastic to the need. If it turns out that extruded plastics can be used, the problem resolves itself into selecting a type and brand of pipe. To do this the engineer should evaluate each of the products available to him in terms of pressure-carrying capacity and price. The pressure-carrying capacity can best be determined using the following formula:

$$P_t = \frac{2\,S_e\,t}{O.D.} \times F_{te}$$

Where:

S_e = effective tensile strength
t = wall thickness
O.D. = outside diameter of pipe
F_{te} = temperature-correction factor, reduction in strength from room-temperature values taken from strength vs. temperature curves

This pressure-carrying capacity for each of the products available to the engineer should be compared to the safety-factor-corrected pressure requirement and to the price of the product. In carrying out this type of cost-strength analyses for various available extruded plastic, it has been our experience that the PVC's always come out ahead.

Paraffin problems . . . In attempts to use plastics for paraffin problems, it has been learned that there are at least two different kinds of such problems which demand different engineering approaches. There are probably more types of such problems, but as yet we have only encountered two.

In one area where paraffin deposition was a problem, plugged lines were characterized by a uniform thickness of deposition around the entire wall of the pipe over substantial lengths of the line. Early installations in this area included both CAB and the kralastics. It was quickly learned that the CAB eliminated this problem, whereas the kralastics aggravated it. A rather rapid conversion to CAB was accomplished, and no further difficulty was encountered.

This paraffin problem has been labeled **"paraffin deposition."** Some of these CAB lines have now been in since 1949 and have given entirely satisfactory service.

The exact opposite results were encountered when CAB was used for paraffin problems in another area. This area had "paraffin" but got very poor service from CAB and, although not good service, got at least better service from kralastics.

Examination of plugged lines in this area showed them to be entirely clean throughout most of their length. Low spots in the line would contain paraffin, but in these places the paraffin was in chunks and was not deposited circumferentially around the pipe but lay in the bottom of the line. The points of actual plugging and failure were normally associated with slow-flow spots. Paraffin deposition in the tubing was quite marked. The lines were of extra-large size in order to offset the plugging problem.

This latter paraffin problem has since been labeled **"gunk accumulation"** and is distinctly different from paraffin deposition. In this case, paraffin deposits in the tubing and is subsequently scraped loose by the paddle rods and ejected into the lines. Very low flow velocities allow this material to accumulate in low spots and in line and in time so fill the line that subsequent slugs coming through result in plugging and failure.

None of the plastics will solve this problem. If one is unfortunate enough to have corrosion problems associated with this problem, then his selection of plastics for combating the corrosion should be based entirely on strength criteria.

In this area, two changes completely eliminated line failures in a well previously afflicted with a phenomenal failure rate. The line was reduced in size from 3 to 2 in. This improved

the flow characteristics as well as increased the actual pressure capacity of the line. PVC was used to replace the CAB. This provided better strength characteristics. No failures have occurred in this line since installation was made 1½ years ago.

From these experiences, the following approach to designing for paraffin problems is indicated. First, determine whether the specific problem is one of paraffin deposition or gunk accumulation. If it is the former, use CAB if pressures allow. Do not use kralastics. We are not yet sure of how the PVC's fit into this picture. If the problem is one of gunk accumulation, design entirely for strength. If an extruded plastic is used, this means one of the PVC's.

Maintenance costs . . . The success or failure of engineering with plastics can pretty well be indicated by a look at maintenance costs. A previously cited A.P.I. paper[5] has covered this facet of plastics use quite extensively; therefore, here will be cited only one set of such data illustrating a particular point.

TABLE 5—RESULTS OF LABORATORY IMMERSION TESTS

(Coatings listed were immersed in 3 per cent NaCl saturated with H_2S for a period of 30 days, then visually and microscopically inspected)

Type and results—

Vinyl (factory-applied)—Blistered and failed to adhere

Vinyl (paint-on)—Blistered

Phenolic (paint-on)—Blistered

Furfural alcohol (paint-on)—Penetrated by H_2S and coupon corroded underneath coating

Phenol-furfural (paint-on)—Blistered

TABLE 6—COATINGS SUBJECTED TO VARIOUS FIELD TESTS AND APPLICATIONS

Type and remarks—

Vinyl (paint on)—Entire line installed in sour lead line service—coating blistered and peeled within 9 months.

Vinyl (paint-on)—Two strings of injection well tubing and one string of salt water disposal well tubing installed in sour brine systems. All failed within 9 months.

Vinyl (paint-on)—Nipple installed in injection line carrying sour brine. Failed within a few months.

Epoxy (paint-on, amide-cured)—Satisfactory results on nipple installation as above. Not considered typical of results to be expected from paint-on coatings.

Phenolic (paint-on)—Nipple installation as above. Blistered and peeled in few months.

Phenolic (factory-applied, baked-on)—Entire line installed for water injection line carrying sour brine—same line as above nipple tests. Entirely satisfactory service for the 3 years the line has been in service.

Epoxy (baked-on)—Recent installation too early to evaluate. Satisfactory service anticipated, however.

Table 4 gives maintenance-cost information on lines in the pool mentioned previously, where corrosion and line plugging by gunk accumulation were coincident problems. Column 8 clearly illustrates the importance of knowing the problem and selecting the plastic to fit it.

At the outset, both CAB and kralastic lines were installed in this pool. From these figures it is evident that neither CAB nor kralastics were giving good service. However, of the two, CAB, because of its low strength, was certainly the worst.

Had these hindsight figures and analyses been available at that time, substantial savings could have been made by using PVC at first. Part of the time lag involved in choosing PVC for this application was the result of installing a rejectable-quality PVC pipe, listed as PVC (Early) in the table. This, too, shows up in the maintenance-cost data.

Installation

Shivel's paper[5] covers most of the aspects of laying plastic pipe in the 12-point list of precautions he gives under the section on laying of pipe. Engineers faced with the use of plastics would do well to read the paper with particular emphasis on these 12 points. On several of these points one should elaborate a little.

With regard to the use of plastic pipe on surging wells, if the magnitude of the surges is well defined, this need not eliminate the use of plastics, assuming the peak pressures do not exceed the capacity of the pipe. The use of a recording pressure gage can be effective in determining peak pressures if installed for periods of several weeks. These peak pressures must be below the capabilities of the material in terms of its effective tensile strength.

An accurate evaluation of different manufacturers' products and the introduction of a safety factor known to the engineer can only be accomplished by computations as described previously. Different manufacturers can be expected to crown the limit of their products to different degrees. Using recommended working pressures of the manufacturer may not permit a safety factor which is sufficient in the engineer's estimation.

In any case, the engineer should know what this safety factor is and that it has been determined on the basis of "effective tensile strength," not on "tensile strength." Comparison of manufacturers' prices must be made entirely on the basis of pressure-carrying capacity using effective tensile strength. This eliminates false economies that are sometimes inherent in thinner-walled products and permits comparisons between products of different strength characteristics.

When applying coatings to steel pipe, the coupling should be removed and the threads of the pipe properly coated along with the inside of the pipe. When the pipe is made up, the collar and threads should be checked for cleanliness; and the inside and outside threads should be liberally coated with resin before being made up. Careful attention to this part of the makeup can substantially reduce problems at the couplings.

"Successful plastics engineering demands the development by the engineer of a practical engineering philosophy applicable to plastics. Engineering is an exact science which follows essentially the same rules, regardless of the material involved. The practical engineer develops . . . time-saving short cuts when using materials with which there exists considerable familiarity."

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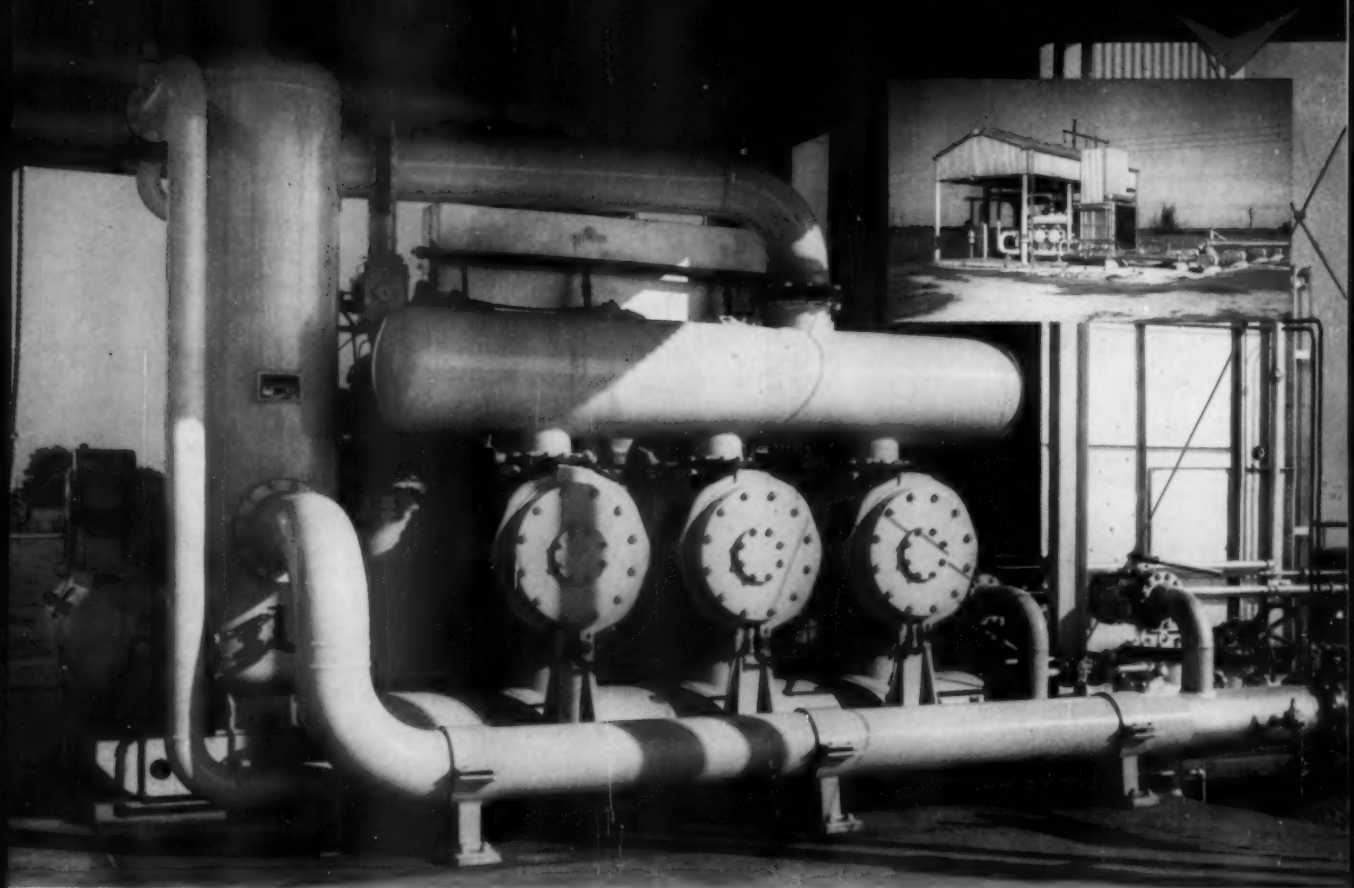

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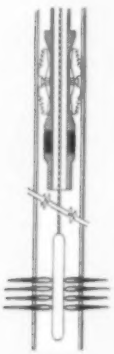

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ELEMENTS OF FIELD PROCESSING—38

Examples Showing Application Of Gas-Flow Equations

By Dr. John M. Campbell

THE FOLLOWING examples will serve to illustrate the application of the gas flow equations developed in Parts 34-37. For simplicity, the Weymouth equation, uncorrected for gas compressibility, will be used as an illustration of the principles involved.

Example 1 . . . A portion of a large, gas-gathering system consists of a 6.067-in. i.d. line 9.4 miles long that is handling 7.6 M.M.c.f.d. of gas with an average specific gravity of 0.64. The pressure at the upstream end of this section is 375 psig., and the average delivery pressure is 300 psig. The average temperature is 73° F. Due to new well completions, it is desired to increase the capacity of this line 20 per cent by looping with additional 6.067-in. i.d. line. What length is required?

Solution . . . Let Y represent the length of the loop section as shown below:

The new flow rate $Q_1 = (1.2)\ (7.6) = \mathbf{9.1\ M.M.c.f.d.}$

The looped section may be represented by a single line D_o. From Equation 6 (Part 37), remembering that all lengths are the same:

$$D_o = [(6.07)^{8/3} + (6.07)^{8/3}]^{3/8}$$

$$= \mathbf{7.9\ in.\ i.d.}$$

A Weymouth equation for each section may now be written:

$$9.1 \times 10^6 = (433.5)\ (520/14.65) \times \left[\frac{(390)^2 - P_A^2}{(Y)\ (0.64)\ (533)}\right]^{1/2} (7.9)^{8/3}$$

$$9.1 \times 10^6 = (433.5)\ (520/14.65) \times \left[\frac{P_A^2 - (315)^2}{(9.4-Y)(0.64)(533)}\right]^{1/2} (6.07)^{8/3}$$

Note that 14.7 psi. has been added to each gage pressure to convert it to absolute pressure. Since there are two independent equations and only two unknowns, these questions may be solved algebraically for Y.

Each equation may be solved for P_A and Y to yield:

$$7{,}950Y + P_A^2 = 175{,}000$$

$$1{,}948Y + P_A^2 = 152{,}000$$

If one is subtracted from the other to eliminate P_A:

$6{,}002Y = 23{,}000$ or $\mathbf{Y = 3.83\ miles}$

This is then the necessary length of the loop (parallel) line to increase the flow. The same approach would be used if it were desired to lower the line pressure at the same flow rate.

The above represents the general algebraic solution of the problem. In this case, the equation for "Looping Requirements" shown in Table 1 of Part 37 may be used and represents an easier solution.

$$X = \frac{1 - (Q/Q_1)^2}{1 - [D^{8/3}/(D^{8/3} + D_1^{8/3})]^2}$$

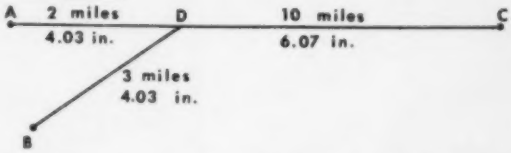
$$= \frac{1 - (7.6/9.1)^2}{1 - \left[\dfrac{(6.07)^{8/3}}{(6.07)^{8/3} + (6.07)^{8/3}}\right]^2}$$

$$= \mathbf{0.407}$$

Therefore, the length of the loop section is equal to:

$$(0.407)\ (9.4) = \mathbf{3.82\ miles}$$

Example 2 . . . The following system is to be designed for the gathering of gas. Well "A" is a flowing gas well that will deliver 3.0 M.M.c.f.d. Lease "B" contains high-gas-oil-ratio oil wells. It is necessary to determine what compressor discharge pressure is necessary in order to deliver 1.75 M.M.c.f.d. from Point B. The pressure at the transmission line (Point C) is 300 psig. Average flowing temperature will be 85° F. The gravity of the flowing gas is 0.63, and that of the casing-head gas is 0.71. The line diameters shown have been arbitrarily fixed because of pipe availability.



It is obvious that once the pressure at Point D is obtained, P_B may be found. Furthermore:

$$Q_{AD} + Q_{BD} = Q_{CD}$$

The average specific gravity in line CD is estimated to be:

$$\frac{(3.0)\ (0.63) + (1.75)\ (0.71)}{4.75} = \mathbf{0.66}$$

For line CD:

$$4.75 \times 10^6 = 433.5\ (520/14.65) \times \left[\frac{P_D^2 - (315)^2}{(10)\ (0.66)\ (545)}\right]^{1/2} (6.07)^{8/3}$$

or $\mathbf{P_D = 350\ psia.}$

Solving for line BD:

$$1.75 \times 10^6 = (433.5)\ (520/545) \times \left[\frac{P_B^2 - (350)^2}{(3)\ (0.71)\ (545)}\right]^{1/2} (4.03)^{8/3}$$

$$P_B = \mathbf{362\ psia. = 347\ psig.}$$

This, therefore, is the required compressor discharge pressure if the compressibility factor is neglected. If the compressibility had been incorporated, as shown in previous discussions, the pressure required would have been a few per cent less.

In actual practice it would be desirable to incorporate a pipeline efficiency factor into the solution if any quantity of liquids was anticipated (Part 35). In the pressure range studied, with an efficiency of about 90 per cent, the pressure would be increased about 5 psi. In any event, a 10 to 20-psi. safety factor should be incorporated into the discharge pressure to allow for unforeseen factors that may arise. **End.**

The author is chairman, school of petroleum engineering, University of Oklahoma, Norman.

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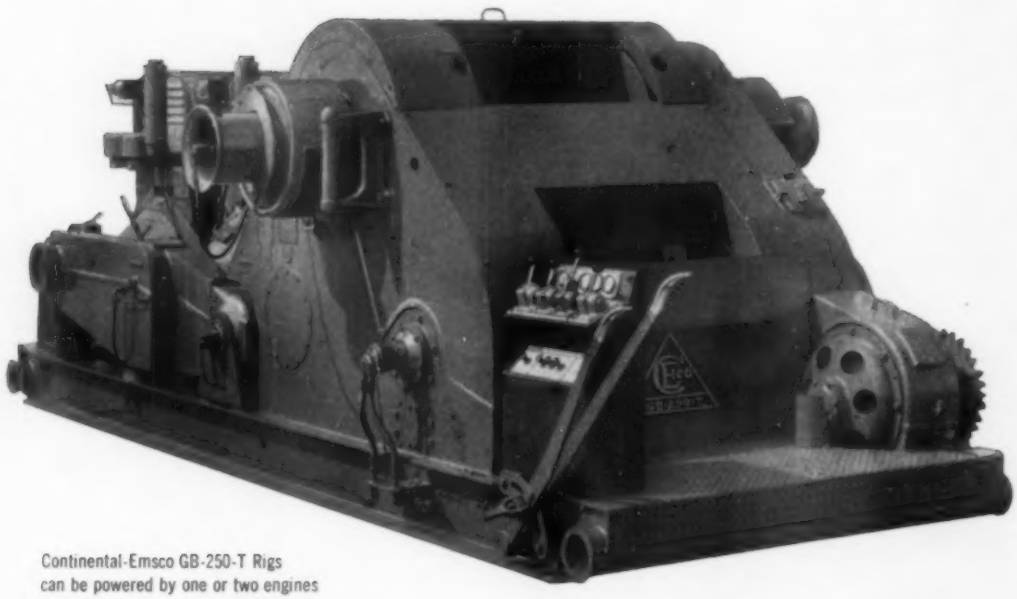

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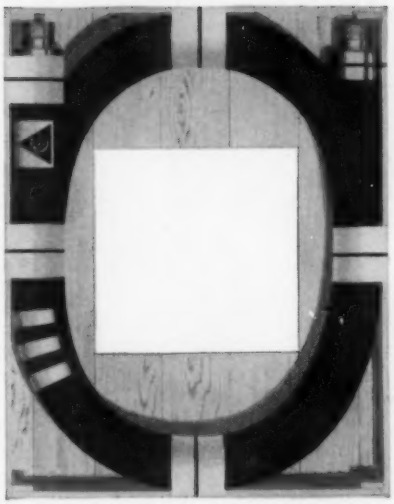

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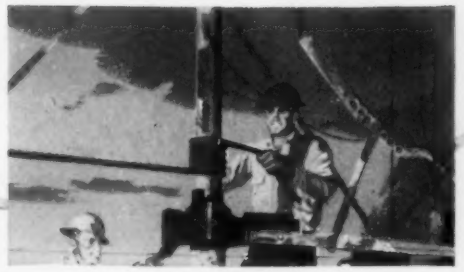

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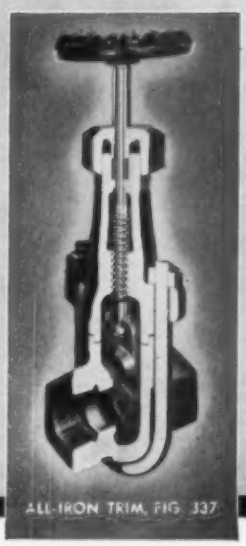

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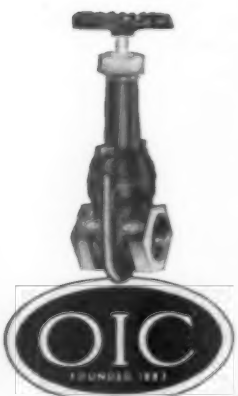

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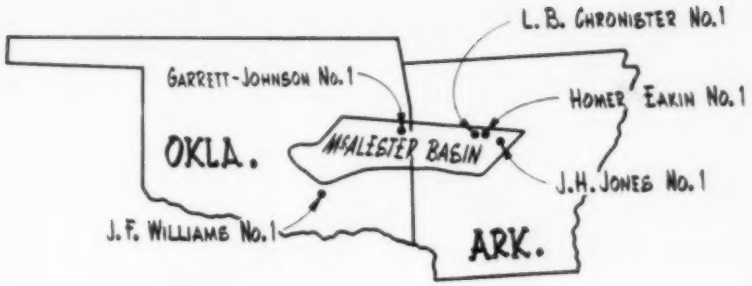
HARD ROCK characterizes the formations drilled in the McAlester basin. That's one reason Carter drilled these wells with air and gas. Fig. 1.



McAlester basin becomes proving ground as . . .

Air and Gas Drilling Gain Prestige

By John H. Adams

Optimum rotary speed and the limit on bit life have been found. Air velocity must be chosen on basis of observation of cuttings removal. A bit designed for air drilling is needed.

ROTARY drilling with air or gas as a circulating medium has been highly successful in four wells in the extremely hard-rock area of eastern Oklahoma and northwest Arkansas. An over-all savings of 22 per cent was realized by using air or gas rather than conventional rotary mud. Exhaust-gas drilling in one well in this area was not an economic success.

Results with this new drilling technique show:

- **Penetration rate** increased 184 per cent compared to mud-drilled wells.
- **Average footage per bit** increased by 630 per cent.
- **Optimum rotary speeds** were from 40 to 60 r.p.m.
- **Bit life** in hard Atoka shale was 300 to 350 ton-hours at optimum rotary speed.
- **Air velocities** below 2,000 ft. per minute were insufficient to remove cuttings at depths below 4,700 ft.

Until the time that air or gas drilling was introduced in the McAlester basin area, cable tools were used extensively in this extremely hard-rock country. A common practice when standard tools were not used to drill from top to bottom was to drill to a depth of from 3,000 to 4,000 ft. with cable tools and then move in rotary tools to finish the well.

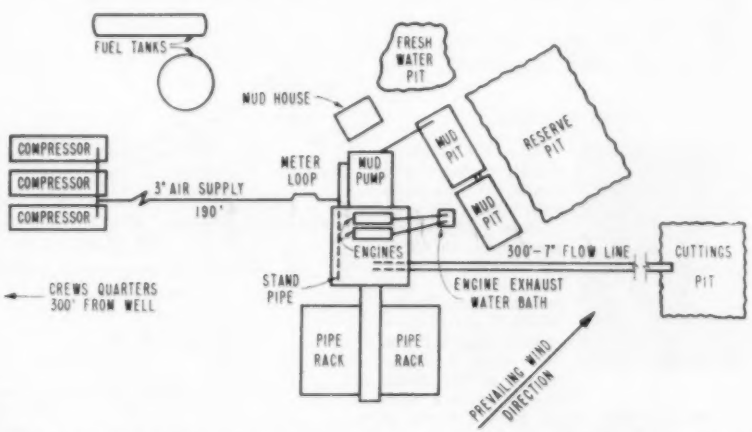
This paper reviews Carter Oil Co.'s experience in drilling five wells with air or gas in this area. This drilling technique was highly successful at three wells, was not an economic success at one well, and the fifth well is an active drilling location. The locations of the wells are shown on the map, Fig. 1.

Advantages and Disadvantages

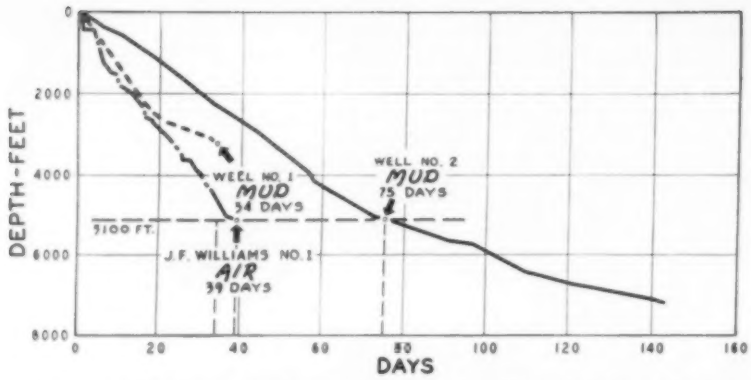
The advantages and disadvantages of air and gas drilling generally are becoming well known to the industry and will not be discussed in detail. The principal advantages observed while successfully drilling a total of 14,409 ft. of hole with air or gas are summarized as follows:

1. Average penetration rates were increased by 184 per cent when comparing air and gas drilling with mud-drilled wells in the same area.
2. The average footage per bit was increased by 630 per cent.
3. The formation permeability is relatively undisturbed when drilling into a productive formation.
4. Formations are easily and effectively tested at all times while drilling. This advantage virtually eliminates the possibility of passing up commercial oil or gas production.
5. Zones of lost circulation were penetrated without difficulty.
6. The average drilling cost was reduced by 22 per cent.

A quick inexpensive method to shut off formation water has not been developed. Therefore, shallow water zones may make air drilling impractical. If the hole is not mudded up for running casing, logging is limited to surveys that can be taken in a dry hole. In some areas these logs are not entirely satisfactory.



LOCATION LAYOUT provides maximum safety at all times. Cuttings and produced gas are blown away from rig. Fig. 2.



AIR SAVED 36 DAYS in drilling this well in Atoka County, Oklahoma. Penetration rate doubled with air. Fig. 3.

Advantages . . .

- Penetration rates were increased 184 per cent.
- Footage per bit was increased 630 per cent.
- Drilling cost cut by 22 per cent.

In areas of soft or easy drilling, where penetration rates are high and drilling cost per foot low, air or gas drilling probably is not competitive. Thus far, Carter's experience in air drilling has been limited primarily to areas of high drilling cost.

Equipment

Drilling with air or gas requires only minor modifications to conventional rotary equipment. Typical installations and manifolding are available from the literature, and for that reason will not be discussed here.

Compressed air was supplied by trailer-mounted V-type compressors, each rated at 750 cu. ft. per minute at 265 psig. Two compressors connected in parallel were used to drill to a depth of 3,500 ft. in one well and to 4,700 ft. at the other well. Below these depths three compressors were used.

As a safety precaution, all equipment was strategically located to insure maximum safety at all times. This is shown in Fig. 2. Other safety features included explosionproof lighting, sparkproof ignition system for rig engines, fire extinguishers, fans, spinning ropes in place of chains, and water baths for engine exhausts.

Mud pits were maintained on a standby basis to kill the well if such action became necessary. In the event that production was obtained, a float was installed in the drill pipe to facilitate stripping out without mudding up. As an added precaution, a swivel valve was installed.

Well Performance

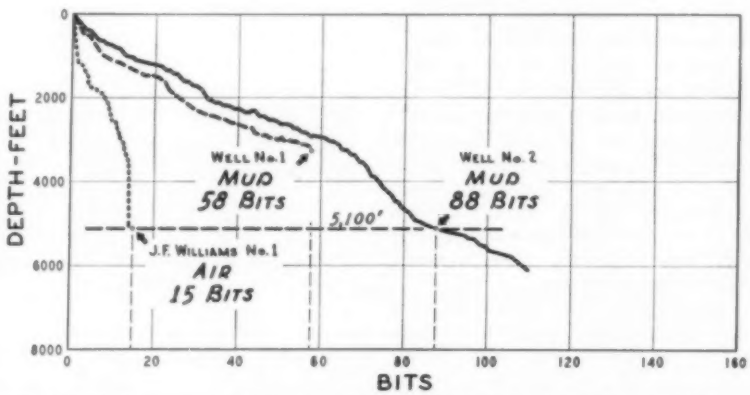
The 1 J. H. Jones, located in Conway County, Arkansas, was Carter's first experience in drilling with a gaseous circulating medium.[1] At that time, from a safety standpoint, the industry had some reservations about using air for wildcat drilling. For this reason, exhaust gas was used. The application was limited to drilling three intervals totaling 1,862 ft. because of formation water and mechanical difficulties which made it necessary to convert to mud.

Although penetration rates and bit performance were improved when compared with mud drilling, use of this technique involves additional expenditures for equipment required to cool and dry the exhaust gas and for prevention of corrosion. These expenditures are not required in the cases of air and gas drilling. Experience has shown that these latter two methods can be safely used with proper precautions.

The 1 J. F. Williams, located in Atoka County, Oklahoma, was Carter's first air-drilled well in this area.[2] Drilling from under surface casing to the well's total depth of 5,093 ft. was an unqualified success. This is illustrated by the fact that only 39 days and 15 bits were required. By comparison, a mud-drilled well located in the same general area required 72 days and 89 bits to drill to the same depth (Figs. 3 and 4).

The average penetration rate was 6.9 ft. per hour. By comparison, the average penetration rate for two nearby mud-drilled wells was 3.3 ft. per hour or 52 per cent less than that for the air-drilled hole.

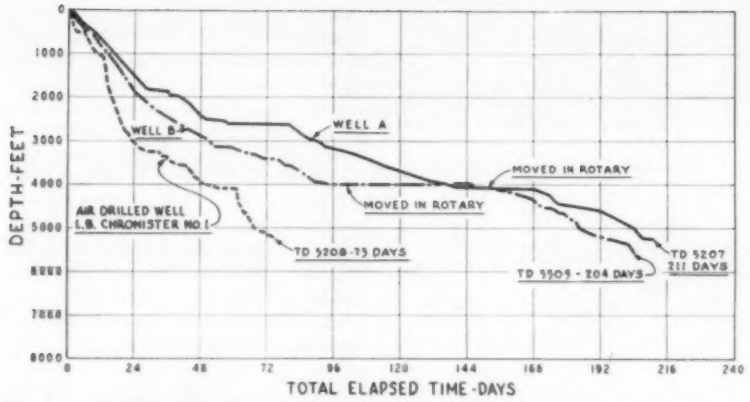
Water trouble . . . The 1 L. B. Chronister, located in the Moreland pool, Pope County, Arkansas, was the second well drilled with air by Carter in the McAlester basin area. It is difficult to make a valid comparison with nearby wells which used a combination cable-tool and rotary-drilling technique. But Fig. 5 presents a com-



BIT SAVINGS was very impressive in the air-drilled hole in Atoka County, Oklahoma. Fig. 4.

THE AUTHOR

John H. Adams is district engineer with Carter Oil Co., Seminole, Okla. He was graduated in civil engineering from Clemson College in 1949 and at that time joined Carter. During World War II, he was in the U. S. Air Force. The paper was presented at the spring meeting of the Mid-Continent District of the A.P.I. Division of Production, Tulsa, Okla., under the title of, "Air and Gas Drilling in the McAlester Basin Area."



NEW METHOD of drilling with air saves the time required to move in a rotary to complete a hole started with cable tools. Fig. 5.

Possibilities . . .

"Development of a technique for handling and/or shutting off formation water would increase the opportunities for using this method for drilling."

parison of the elapsed time vs. depth for this well and two nearby wells. A total of 79 days and 66 bits were required for the air-drilled well to a total depth of 5,208 ft., as compared to an average of 115 days cable-tool time and 81 days rotary time for the two nearby wells to drill to the same depth.

The only difficulty experienced was a small water seep met below 3,200 ft. The water volume was low and did not affect the penetration rate. However, it was sufficient to ball up the dust and create tight spots which were sufficient to stick the pipe. The hole size was subsequently reduced from 9⅞ to 8¾ in., and the 8-in. drill collars replaced with 6-in. drill collars. No further difficulties with moisture were experienced.

Used natural gas . . . The third well to be drilled below surface casing to the total depth with air or gas was the 1 Garrett-Johnson, located in the Cartersville Gas Pool in eastern Oklahoma. High-pressure natural gas was available for drilling this well.

A cost comparison showed that a saving of 11.2 per cent would be realized by using natural gas rather than compressed air. Drilling with gas proceeded to a depth of 5,762 ft. virtually uninterrupted, and required 29 days and 10 bits.

The outstanding performance of gas drilling is shown by a comparison with nearby wells drilled with mud, Fig. 6 and Fig. 7. These comparable wells averaged 54 days drilling time and required 63 bits to drill to the same depth. The average penetration rate with mud was 6.4 ft. per hour as compared to 11.6 ft. per hour for gas drilling.

The only difficulty experienced while drilling with natural gas was that in drying up the hole during the early stages of drilling. Gas from the transmission line was delivered to the well at temperatures ranging from 18° to 45° F., which were too low to dry up the hole. An indirect gas heater was installed to raise the temperature to 85° F. and the difficulties were corrected.

Drying up water . . . The 1 Homer Eakin, also located in the Moreland pool, Arkansas, was the fifth well to be drilled with air or gas in this area. Now this well is an active drilling location.

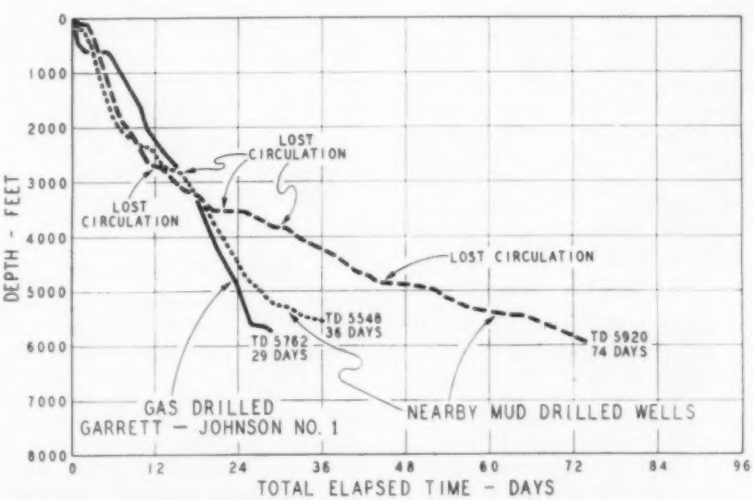
Initially, natural gas from the offset 1 L. B. Chronister was used for circulation. However, the produced gas had a high content of fracture kerosine which was sufficient to ball up the dust and prevent returns. Installation of a combination separator and mist extractor did not correct the difficulty, and it was necessary to move in compressors and use air for the drilling fluid.

This well is of particular interest because considerable difficulties were experienced with moisture in the hole. The volume of water was only 1 to 3 bbl. per hour, but drilling ahead with air was slow because of the balling up of the dust and lack of returns to the surface. Often after trips it was necessary to circulate from 12 to 14 hours to dry up the hole before drilling ahead. Because of this water problem, over-all penetration rates at the 1 Eakin were considerably less than those experienced at the offset air-drilled 1 Chronister.

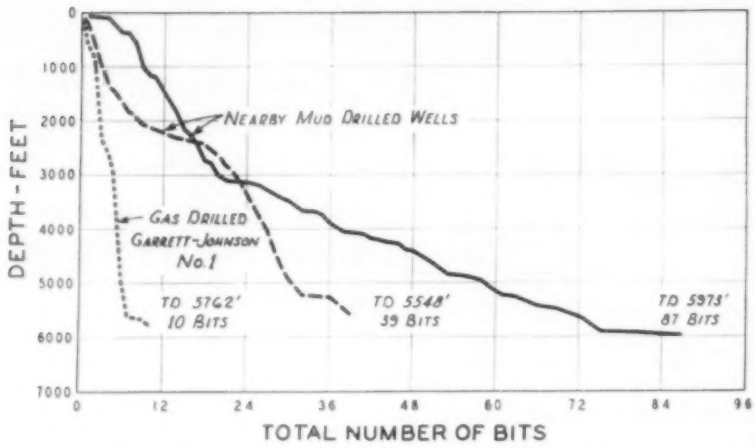
Use of a foaming agent or surfactant mixed in water and added to the air stream was very successful in alleviating the trouble. With its use, the hole would dry up in 1 to 3 hours and some dust was obtained at the surface.

Bit Performance

Operations at 1 Williams was Carter's first extensive experience with air drilling in this area. Rotary speeds



DRILLING WITH GAS saved 11 per cent of the cost of using air. Gas temperatures were low and a heater was installed so the gas could dry up the hole. Fig. 6.



BITS USED WITH GAS DRILLING were only 10 compared to 39 and 87 on mud-drilled holes. Fig. 7.

were varied from 40 to 160 r.p.m. and bit weights ranged from 2,000 to 16,000 lb. At speeds of over 60 r.p.m., early cutter failures were responsible for terminating the service life. At rotary speeds less than 60 r.p.m. there was little wear to the cutters, and wornout bearings were usually the cause of bit failure.

The change in rotary speed had little or no effect on the penetration rates. Based on these findings, rotary speeds were held to the 40 to 60-r.p.m. range.

While drilling in the thick Atoka shales, common to this area, it was exceedingly difficult to determine when to pull the bit. Some bits were pulled that showed little or no wear, whereas others were worn down to exposing the bearings. Often the penetration rates were unchanged. Valuable rig time was lost while making unnecessary trips to check the bits.

Careful records of rotary speed, bit weight, and time on bottom were kept. Based on these observations for two wells, it appears that the optimum rotary speed of from 40 to 60 r.p.m. provides a bit life of from 300 to 350 ton-hours while drilling through the thick Atoka shale. Although longer runs of up to 500 ton-hours have been obtained, it is probably advisable to pull and check the bit at 300 to 350 ton-hours in this area.

Air and Gas Volumes

Air or gas velocities of from 2,000 to 3,000 ft. per minute generally have been accepted as the rate required to effectively remove the cuttings from the hole. Based on calculations at the 1 Williams, two 750-cu. ft. per minute, 265-psig. compressors initially provided an annular velocity of 3,890 ft. per minute.

At a depth of 4,700 ft., prior to adding the third compressor, this annular velocity had decreased to an approximate average of 1,900 ft. per minute. The hole size of the 1 Williams was based on a caliper survey which showed actual diameters ranging from 9 to 25 in. and averaging 12¼ in. At 4,700 ft. the 1,900-ft. per minute velocity was insufficient to remove the larger cuttings, as evidenced by the finely powdered samples that reached the surface.

The inability to remove the cuttings was further illustrated by the fact that, after circulating 2 to 3 hours before making a connection, as much as 100 ft. of caving would be in the hole when drilling was resumed.

After the third compressor was installed, the annular velocity was increased to an approximate average of 2,660 ft. per minute and the large samples were lifted to the surface. After the velocity increase, the hole would clean up in a matter of minutes before making connections.

This experience would indicate that because of the irregular hole size, accurate velocities cannot be calculated. Therefore, if the hole stays clean, the air volume is adequate; if not, additional capacity is needed. With a little experience it is not difficult to determine if the cuttings are being effectively removed and the hole is clean.

Possible Improvements

The air and gas-drilling technique is still in the very early stages of development. This drilling method presents the same challenge to industry as did the development of rotary drilling with mud, which has made remarkable progress in recent years. Based on limited experience, some ideas for improvement are suggested.

Only minor modifications to the rig equipment are required for air or gas drilling. This is true for the minimum requirements, but more efficient operations could be obtained by specialized equipment. As much as 50 per cent of the total compressor horsepower was lost to friction in the stand pipe, rotary hose, swivel, kelly, and the 4½-in. drill pipe. With larger inside diameters of this equipment, the results would be twofold: The compressor horsepower could be reduced because of lower friction losses, and the larger drill pipe would reduce the area of the annulus and thereby reduce the volume of circulating air required.

Rock bits of all types are not yet available that are specifically designed for air drilling. It is necessary to cut out the water course in conventional bits to avoid excessive pressure drop across the bit. Improved bit performance could certainly be obtained by research and development on a bit designed especially for air drilling.

In selected areas reverse circulation may result in improved performance and reduced costs. Work is now under way on bit designs suitable for reverse circulation. Success may reduce the required compressor capacity by as much as two-thirds.

Additives . . . The field of additives to the air or gas-circulation system is unlimited. Some of these may be improved foaming agents, bit lubricants, penetration stimulants, or well-sealing compounds.

A number of drilling contractors are equipping rigs with air compressors and a number of service companies have them available for rental. Even so, compressors of the proper sizes and pressure ratings are often not readily available. Quite often transportation cost on air compressors is high and prohibits their more frequent use. With continued use, proper-size compressors will become available.

Finally, and probably of most importance, development of a technique for handling and/or shutting off formation water would increase the opportunities for utilizing this improved method for drilling.

Acknowledgment

The author expresses his appreciation for the contributions made by J. A. Kelley, E. M. McCain, C. R. Chambers, J. S. Bottler, Jr., and S. N. Stearns.

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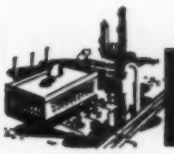
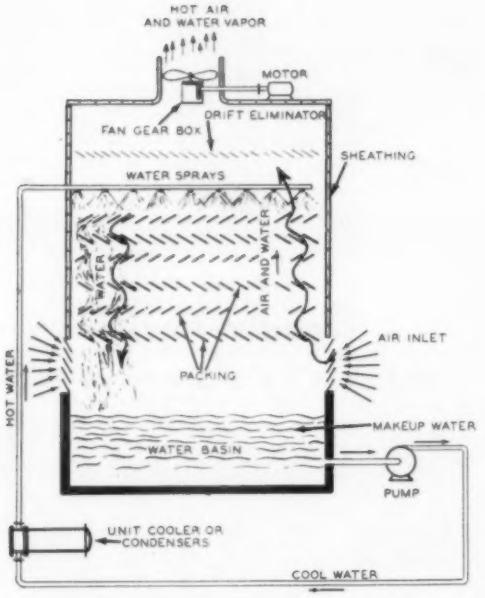
Cooling Systems
Last of Four Parts

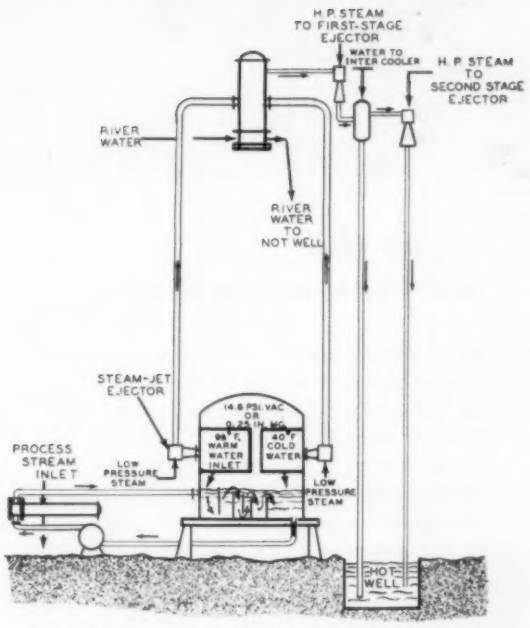


JOB IMPROVEMENT FOR THE PROCESS FOREMAN—99

Barometric and Induced-Draft Cooling Towers



INDUCED-DRAFT cooling tower. Fig. 7.



BAROMETRIC condenser type of water-cooling system. Fig. 8.

FOR constructing towers it has been accepted generally that heart grades of California redwood are well adapted for this purpose; however, some towers have been built of metal, masonite, or transite. Redwood has a potential life in cooling towers in some refineries of approximately 30 years.

The condition of the water is the principal controlling feature in long life. Redwood is a soft material which makes it difficult to fasten with nails. The exterior of the cooling tower sometimes develops a ragged appearance because of the loosening of nailed boards.

Brass bolts and copper nails are used for resistance to water corrosion. Washers are essential. When bolts are tightened the heads will not pull through the soft wood. Cast-iron connectors are satisfactory for anchoring the tower to the concrete basin as well as connecting the framing. Yearly inspection of these parts should be made.

The advantages of mechanical-draft towers over the natural-draft towers are as follows:

1. Require less space.
2. Require less piping.
3. Require only about half the pumping head, which varies from 10 to 30 ft. depending upon design. (Height of mechanical tower does not have to be as great as natural-draft tower.)
4. Realize improved operations due to colder water temperature.
5. Are independent of wind velocity—hence, they can be designed for more exacting performance.

There is one other type of water-cooling system used by refineries to a limited extent. This water-cooling system depends on evaporation to produce refrigeration; however, in this case the equipment is designed to obtain evaporation by lowering the pressure above the cooling water. This equipment uses barometric condensers and steam-jet ejectors to produce a vacuum above the surface of the water. A cooling effect is produced by rapid evaporation. Fig. 8 outlines the flow in this system.

Definitions

1. The name cooling tower is applied to a structure which brings about the cooling of water by evaporation and heat transfer as the water is circulated through the tower in direct contact with a current of atmospheric air.

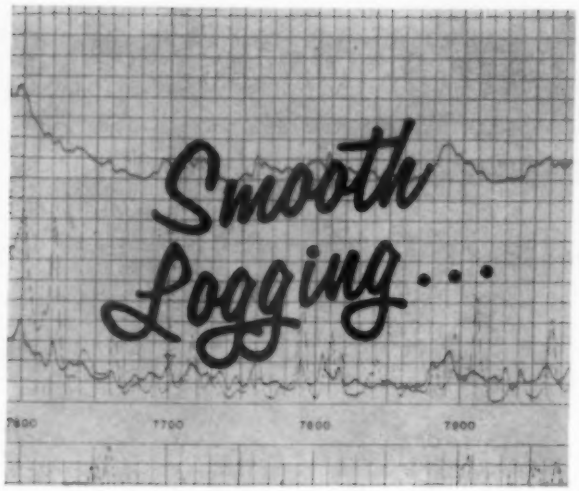
2. Blowdown (sometimes overflow is used) is the continuous or intermittent wasting of a small fraction of circulating water to prevent a concentration of chemicals in the water.

3. Makeup is the water required to replace the water lost by evaporation, blowdown, and small leaks.

The First Three Parts

Part 1—July 15, 1957, page 118.
Part 2—July 22, 1957, page 115.
Part 3 —August 3, 1957, page 103.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.



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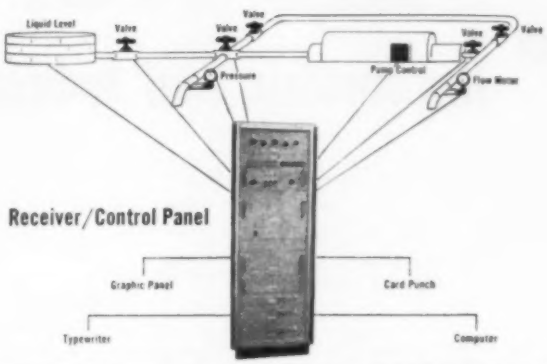

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Nitrogen Removal

Last of Three Parts

Advantages of Nitrogen-Removal Plants

THE entire purpose of presenting Tables 1 and 2, is to emphasize that nitrogen-removal plants are costly, and have little external sources of revenue to make them self-sustaining. Nitrogen-extraction plants are not likely to be constructed unless the operator has no other choice in disposing of his gas or unless it can be made a profitable operation.

Despite the fact that the economic return from the operation of a nitrogen-removal plant is very likely to be poor, there can be some advantages to the operation. These advantages are:

1. A nitrogen-removal plant can recover substantially all of the liquid hydrocarbons as salable products. To any company seeking a source of ethane or a source of material for further chemical processing the answer may be here.

2. The residue gas produced is upgraded in heating value. This is of tremendous importance to a company having large gas reserves of low heating value. Reserves of this nature must be balanced by a volume of gas of higher heating value sufficient for adequate blending. A plant removing nitrogen can offer operating flexibility to any company plagued with reserves of low heating value. Any new transmission line built to serve reserves of low heat value can be smaller in size if nitrogen is extracted prior to sales or distribution. The saving on the difference in the investment between the larger and the smaller transmission lines should be wholly credited to the nitrogen - removal plant.

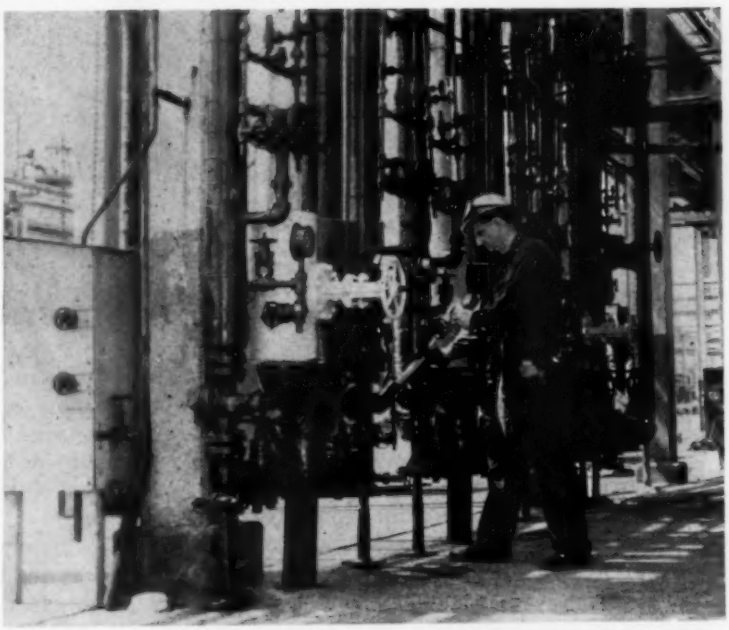
3. By removing nitrogen and other diluents, not only is it possible to increase the heating value, but also to transmit more cubic feet of gas through the same pipeline with the same pressure drop. Any company which sells or distributes gas on a therm basis and not on a cubic-foot basis should be interested for upgrading the gas would be a direct increase in revenue. Very possibly the circumstance might arise whereby a company operating on a therm basis, might find reserves inadequate to support a second line. Then removing the nitrogen and increasing the existing line capacity for higher quality gas might be more advisable than to engage in line looping.

Adequate reserves of suitable gas are becoming more difficult to discover with the passing of each year and consumption or demand for gas is also increasing with each year. More and more companies are giving marginal type gas a closer scrutiny.

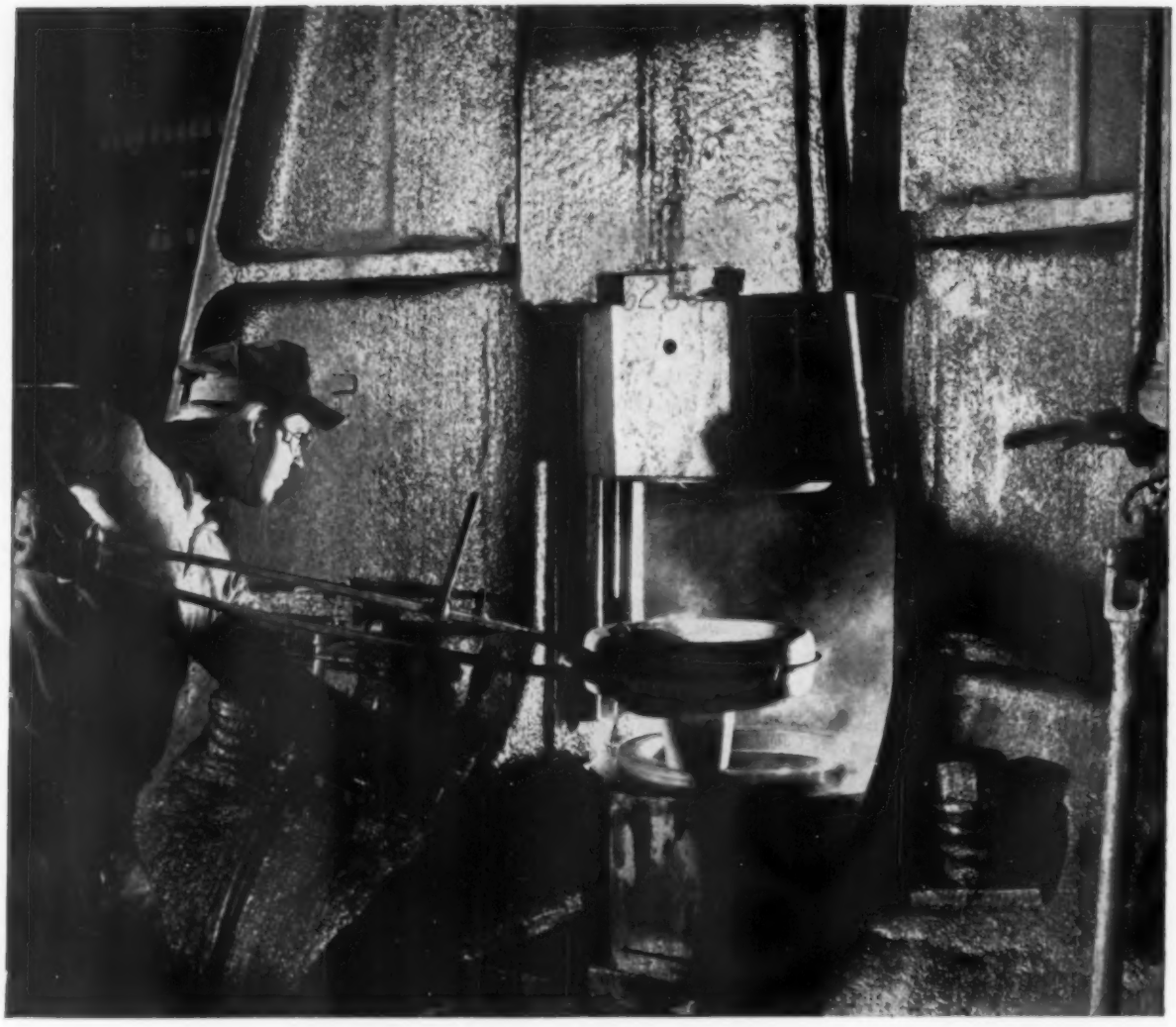
The industry should not be reminded too often of its troubles and woes but nitrogen - removal plants today are at the same point that CO_2 or H_2S removal plants were some years ago. If and when the time is right, and it is absolutely necessary to do so a nitrogen plant will be built.

The First Two Parts

Part 1—Which Nitrogen - Removal Method Is Best? July 8, page 143.
Part 2—Economics of Nitrogen-Removal Plants, July 15, page 120.



LIGHT ENDS—chiefly propane and propylene—enter polymerization plant at Esso Standard Oil Co.'s Bayway refinery through this manifold of lubricated plug valves. Lubricated-plug design was chosen to withstand high pressures and corrosive fluids, and to prevent minute quantities of reactor catalyst in the outlet stream from reaching valve-seating surfaces. A 3-in. Rockwell-Nordstrom lubricated valve is used as a throttling valve on the inlet manifold.



With Every Blow of the Hammer, Strength is Pounded In

The ram of the forging hammer strikes with an almost incredible force. But it neither shatters nor ruptures the hot steel beneath it. Instead it actually "pounds in" strength, and at the same time causes the steel to be shaped by the dies.

The photograph above shows an everyday occurrence in the Bethlehem drop-forge shops. There a large battery of steam and board drop hammers is constantly at work, pounding out strong, sturdy forgings of many different designs. Some of these pieces weigh as little as a pound. Others, like the one in the picture, run big.

For years Bethlehem has been making drop and other closed-die forgings for the petroleum, mining, aviation, automotive, and electrical industries, to name but a few. Both quality and variety are assured by excellent facilities, which include die-sinking shops, hammers to 8,000 lb, mechanical presses to 3,000 tons, and full heat-treating equipment.

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By W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

What Should Electric Power Cost?

What is a good average cost for the electricity purchased by petroleum refiners? Is 1 cent per kilowatt a good figure? S.W.F.

The price of electricity varies throughout the United States and it also varies with the amount of electricity continuously consumed. For the year 1948, the Edison Electric Institute[1] estimates that the average cost for large industrial users (over 50 kw.-hr.) in the United States was 10.08 mills (1.008 cents) per kw.-hr. Another source[2] estimates 9.27 mills per kw.-hr. for the year 1947. These are not far apart when brought to a common date for comparison, such as 1956, when the two prices would be respectively 9.52 and 8.91 mills (see Table 1). It will be shown later herein that the price paid by petroleum refiners is even lower, perhaps 8.5 mills (1956).

The cost of electricity has scarcely changed since 1926. Table 1 shows the price index of electricity for all users (large and small) as published each month by the Bureau of Labor Statistics.[3] Although it applies to retail sales, it is assumed that the prices paid by large industrial users has varied in the same general way. Prices are influenced somewhat by the price of coal (or fuel) as note 1948 and 1949 when the fuel price was high, but this effect has been obscured to a large extent by the increasing efficiency of power production. Thus, the pounds of coal required per kw.-hr. has decreased as follows:

1900	6.95
1910	4.7
1920	3.0
1930	1.6
1940	1.34
1950	1.19
1955	0.95
1960 est.	0.88

However, the efficiency of production is now so high that the price of electricity in the future will be governed to a larger extent than in the past by the cost of fuel. This, of course, does not contemplate an early use of major new sources of electrical power such as atomic energy.

TABLE 1.
Price Index for Electricity[3]
(1956 Basis)

	Index		Index
1928	194.5	1948	106.0
1930	106.0	1949	110.5
1931	107.0	1950	107.0
1932	113.5	1951	104.5
1933	102.0	1952	105.0
1944	95.5	1953	105.0
1945	99.5	1954	108.0
1946	106.5	1955	103.0
1947	104.0	1956	100.0

TABLE 2.
Approximate Cost of Refinery Purchased Electrical Power (1956)

	Mills per kw.hr. (1956)	Index[2,4]
East North Central	10.2	120
Mid-Atlantic	9.35	110
U.S.A. refinery av.	8.5	100
Mo., Kans., Colo., and N. M.	8.05	95
Ark., La., Okla., and Tex.	6.8	80
Calif.	5.95	70
Mont. and Wyo.	5.6	66
Canada	5.1	60

TABLE 3.
Literature Indications of the Cost of Large-Scale Electrical Power

Region	Cost per kw.-hr.		1956
U.S.A.[2]	9.27	(1947)	8.91
U.S.A.[1]	10.08	(1948)	9.52
U.S.A.[5]			*7.82
U.S.A.[6]			*12.1
U.S.A.[7]			*9.66
1956 average U.S.A. cost			9.2
Michigan[16]	10.71	(1950)	10.1
East Coast[6]	13.00	(1955)	12.8
East Coast[7]	10.5	(1955)	10.2
Oklahoma[8]	6.2	(1956)	6.2
Oklahoma[8]	8.0	(1956)	8.0
Midwest[8]	9.0	(1949)	8.15
Oil regions[4]	8.14	(1953)	7.74
Oil regions[9]	7.5	(1953)	7.13
Oil regions[10]	7.0	(1954)	6.48
Oil regions[11]	8.0	(1953)	7.6
Oil regions[12]	8.0	(1956)	8.0
Oil regions[13]	7.0	(1937)	7.0
Oil regions[14]	9.0	(1952)	8.61
Oil regions[15]	10.0	(1932)	8.8
1956 average refinery cost			8.5

*Estimated from prices at various regions by using the Index of Table 1.

Power from hydroelectric plants is cheap and the low cost of natural gas in the Southwest and to some extent California, makes power cheaper in such areas (see Table 2). The index of Table 2 is based mainly on data published in References 2 and 4, and the prices are based on the average of 8.5 mills found in Table 3.

In searching the literature for refinery power costs, little authentic information could be found because most writers, engineers, etc., appear to have used some general figure such as 1 cent per kw.-hr. However, the prices indicated in Table 3 are thought to be authentic. The average cost of electrical power to refiners appears to be about 8.5 mills (or perhaps as low as 8.25 mills).

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A welder joins sections of pipe line which will carry Barinas crude to market. Unlike practice in this country, in Venezuela pipe line is left above ground.

Making History in Venezuela

Deep in the heart of Venezuela, Sinclair's persistence in the search for oil is reaping its reward. That nation's most remote oil field, the Barinas field, will soon send its first oil to market. The volume will about double the crude output of Sinclair's subsidiary, Venezuelan Petroleum Company.

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IF YOUR BUSINESS isn't growing as it ought to, the first place to look for trouble is in your key personnel. If you aren't keeping pace with the expanding economy, chances are that the shortage of good managers is the reason.

One way to correct this is to go out hunting for new blood. Trouble is, there's not enough available. So after looking around, you come back to your own company for the solution. And that is: upgrade the men you already have.

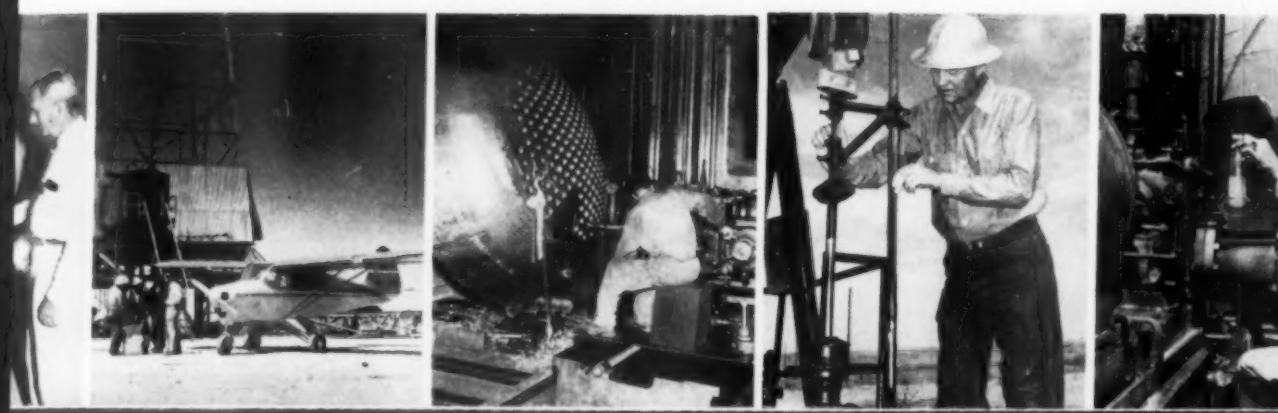
Now the course may be clear enough. But there are good training programs and there are those which aren't so good. One management firm has come up with a plan that works. It's called "Mansurance."

Mansurance is merely a coined word meaning manager insurance. It's a fresh approach to solving personnel problems, devised to avoid the pitfalls common to most training courses:

- Being geared to the average individual taking the course, they often cover ground already familiar to many.
- Being broad in scope, they don't fill the specific need of the individual.

The program that really works has to be tailored to the needs of specific people in specific companies. And to design such a program you have to know the assets each manager already has, what he needs to make him competent for his role in company growth.

Mansurance . . . A



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Management Inventory

The first step is a management inventory. Take stock of each executive and submanagement employe in your company with two independent studies. One evaluation will show what kind of person he is. The other will determine how good he is at his job.

Psychological testing . . . Though widely abused, this method can produce valuable information. No ivory-tower approach will do. The job has to be done by a Ph.D. who knows what he's after, who understands the business.

These tests will reveal the man's temperament, personality, and intelligence. They'll also help predict fairly accurately the fields in which he'll probably succeed.

Competence tests . . . Next size the man up from a management point of view. That's the job of a good objective consultant.

How well is he doing his job? How does he feel about it? Where does he lack training, experience? Does he have vision? Does he understand company problems? How well does he shoulder responsibility?

When you have the answers to these questions, you're ready to put the two sets of facts together. Then you'll likely see the weak and strong spots of each individual.

Management Planning

Now you know what kind of management team you have. Next step is to look and see where your company is going. Where do you plan to take the company, when do you plan to be there, and how do you plan to do it? Translate these answers into personnel needs.

Now, you know what you have. And you know what you want. Put these facts on a chart, side by side, and see where you stand. Here you spotlight the gaps between the two. Bridging these gaps is the real purpose of Mansurance.

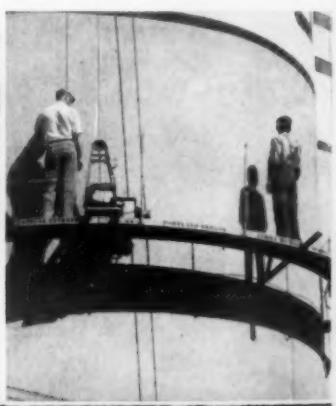
Management Development

The vague problem of inadequate management is now defined clearly. It becomes a problem of personality, social maturity, business maturity, or leadership training. You know what needs to be done to upgrade each individual.

This is where you turn to trained management educators from various school systems who have a record of success in designing programs to fill specific needs for specific individuals. Pool the knowledge of the educators with the knowledge of management and business and you should come up with a training program to produce the results you want. It should correct the principal management weaknesses in the shortest possible time.

Suppose the problem is not lack of training or education. Suppose it's lack of maturity, a bad personality,

A New Management Tool



acement ready to step up

l & Carey, Management Consultants, Denver

the wrong attitude. This calls for personal consultation with a psychologist experienced in these problems. A good psychologist can do wonders.

A management inventory often will reveal needs common to many people in a single firm. This lends itself to classroom or group study. Be careful, though, to stick close to what they really need.

Individual problems must be handled individually. Training courses will vary in length. A few weeks might be enough for one; another might run over a year.

Does It Work?

Reynolds, Ward & Carey has found this approach works better than anything it has tried before. It works better, in fact, than the consultants thought it would.

Here's an example. The president of a large company brought them a problem. It concerned a vice president. The president had almost given up on him and was asking for outside help before firing him.

Evaluation studies showed the vice president to be a man of exceptional ability. He was only 35, with plenty of valuable years ahead of him—if he could be salvaged. He had earned his own way through college as a salesman. He had been a salesman most of his life, and a good one at that. In fact, it was as a salesman that he had met the president and impressed him so much that he was offered a job as vice president.

The man's attitude was good. So were his interest and temperament. But there was a difference in being a salesman and a vice president which he hadn't learned. He didn't understand his new responsibilities. A salesman who had never made anybody mad, he suddenly was faced with making decisions which would be unpopular with some of his employes. And he simply refused to make them.

Since the vice president's attitude was good, he was told frankly what the studies revealed about him. He admitted his fault and agreed with the diagnosis. He confessed he had been unaware of what had been happening. The cure prescribed for him was several books on executive responsibility and 5 weeks of 1 and 2-hour sessions talking over the problem.

First thing the president knew his diplomatic vice president had locked horns with him over a business decision, stood his ground, and won the argument. And the president couldn't have been more pleased.

The ex-salesman now has "executive" in front of his vice president's title. He is no doubt unusual. Changes could be wrought in him in a very short time. But his case does show what can be done.

If you're a businessman, no matter how good you are, you don't build the business yourself. The best you can do is build the organization. The organization builds the business. This is one way to build that organization.

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The Dorr-Oliver CLAYJECTOR for Controlling Weighted Muds

Latest development in controlling drill mud weights is the Dorr-Oliver ClayJector. This new unit is designed specifically for weighted muds . . . will mechanically reject undesirable drilled solids and retain the valuable barites (weighting materials) in the system. Optimum solids content is maintained at a minimum cost for barites which would be lost if solids are controlled by dilution and jetting tanks.

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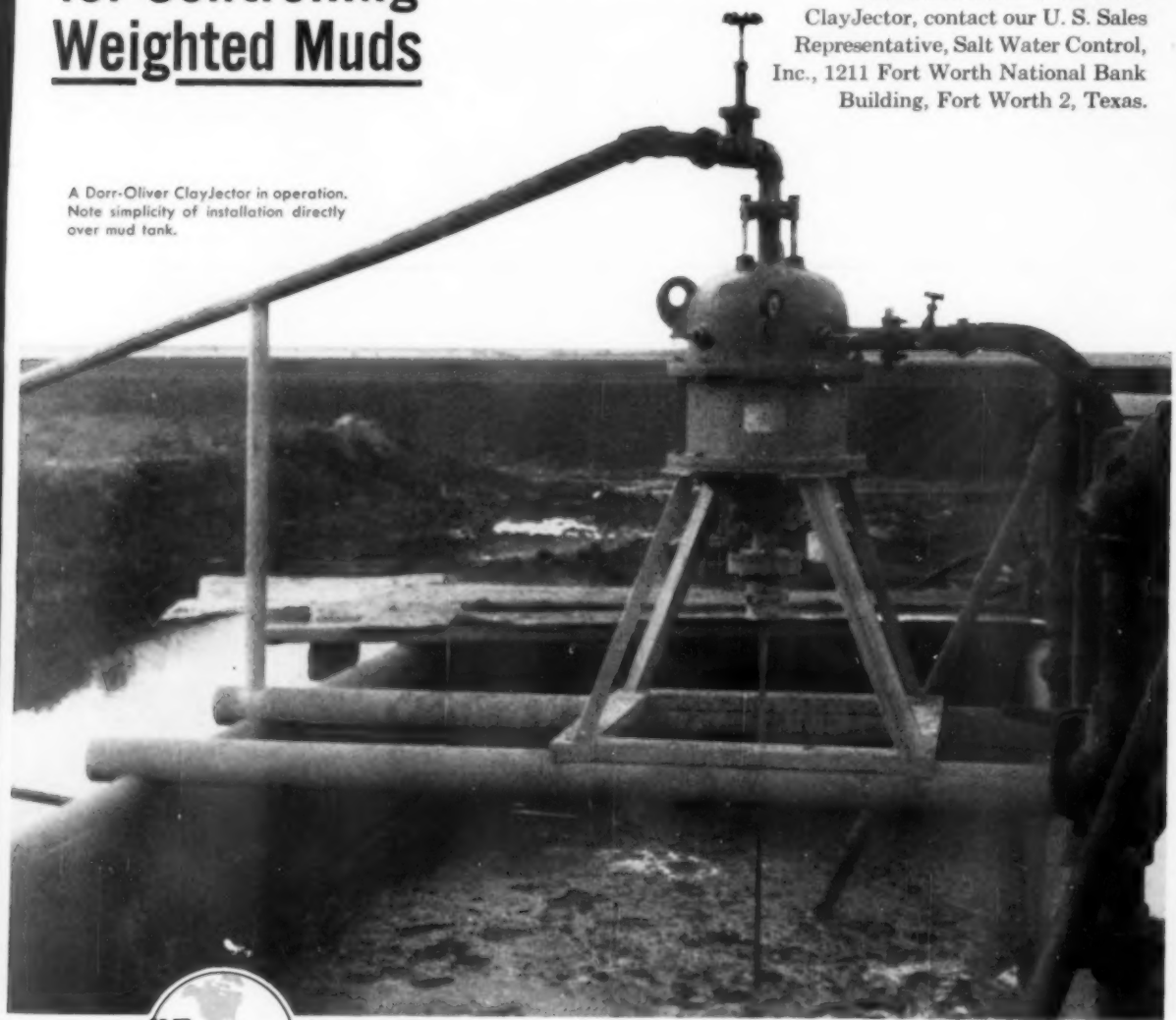
Key to ClayJector efficiency is the DorrClone classifier, a cylinder-conical unit using centrifugal force in place of gravity. Four of these units are manifolded in a common housing with a common feed, overflow, and underflow. Any of the units can be cut out of service without opening the housing to meet variations in circulation requirements.

For more information on the ClayJector, contact our U. S. Sales Representative, Salt Water Control, Inc., 1211 Fort Worth National Bank Building, Fort Worth 2, Texas.

A Dorr-Oliver ClayJector in operation. Note simplicity of installation directly over mud tank.



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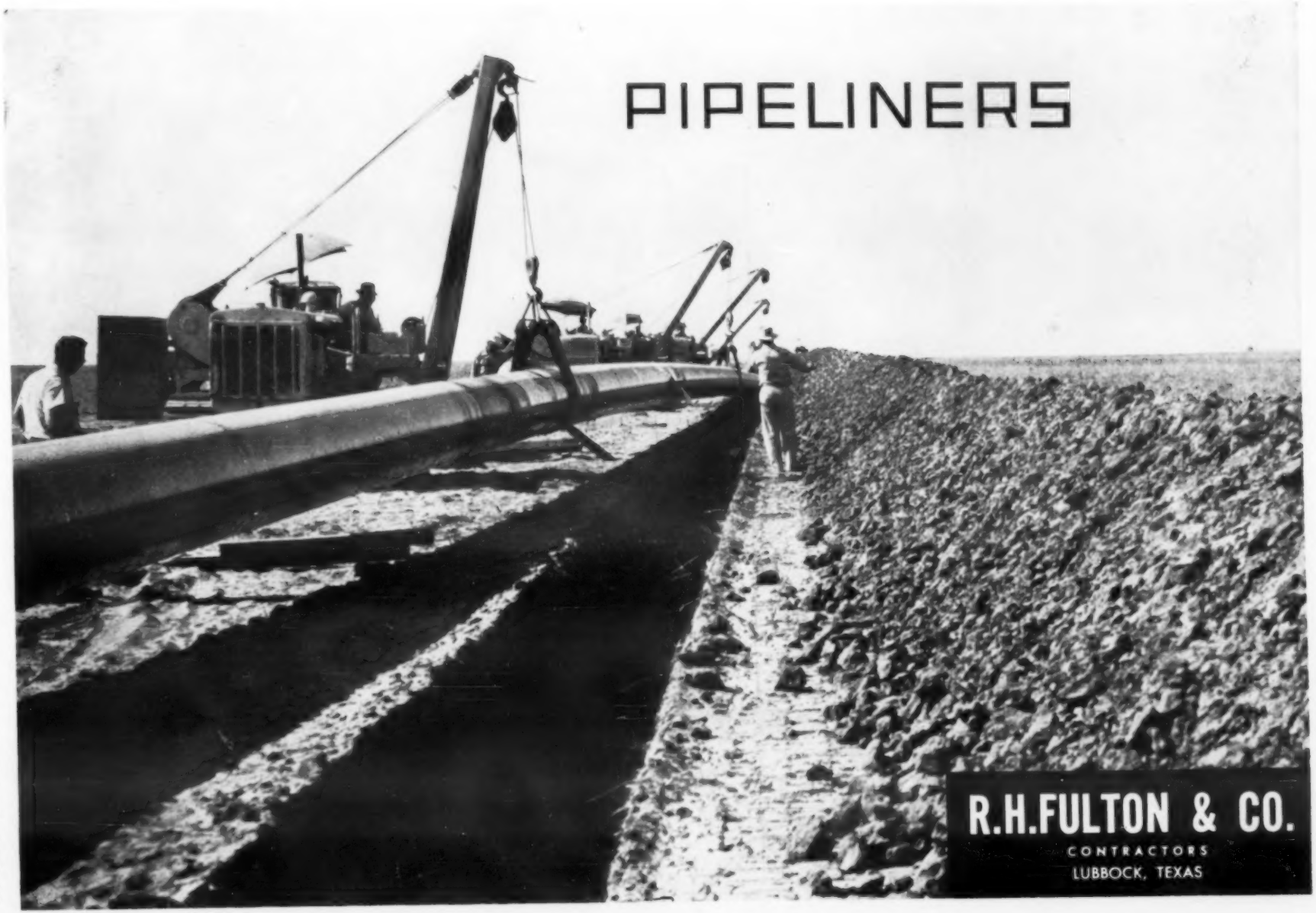
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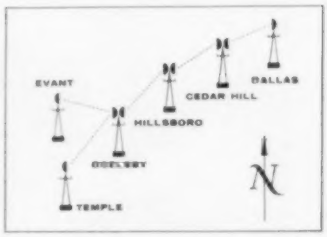
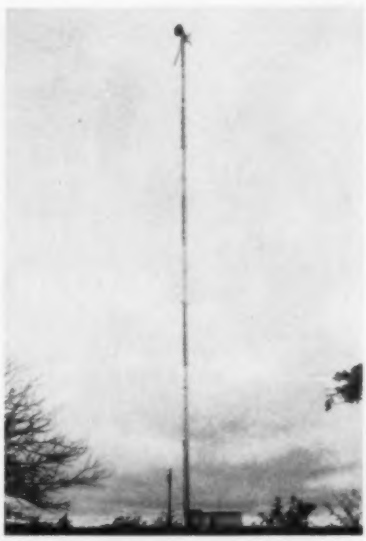


TOTAL PIPELINE SYSTEM of Atlantic Pipe Line Co. Dotted area on map corresponds to block above showing new six-station microwave system.



TALL TOWERS rise in Texas flatland. One of the 300-ft. towers and masonry buildings is shown here. (Photos courtesy RCA.)

New microwave system expands Atlantic's network

By M. S. Collett

TO expand and improve its communications in the Texas area, Atlantic Pipe Line Co. recently replaced a key section of its wire-line system in the vicinity of Dallas with an RCA (Radio Corp. of America), microwave system. The new microwave system is only 171 miles long, but it interconnects with approximately 1,900 miles of remaining wire line. It has removed a major bottleneck in the company's communications network and has allowed it to expand its 4,500-mile communications system to a total of 8,300 miles through the application of additional carrier channels to the wire-line facilities.

The five-channel wire-line carriers are brought into the Dallas office over the microwave system without any major requirement for back-to-back multiplex terminals at the microwave-wire-line junction stations. The microwave system was designed, manufactured, and installed on a turnkey basis. The 171-mile system connects Atlantic's main office in Dallas with pump stations at Temple and Evant, Tex. Initially it will provide 13 voice channels into Dallas, but it is designed for expansion up to 46 channels.

Outage elimination . . . The decision to change to microwave was made after long experience with company-owned wire lines and after a thorough study of other communications media. The new system is expected to improve the reliability of the company's communications network by eliminating major outages due to weather and man-made damage. Typical of such outages experienced on the wire lines was the occasional destruction of the pole line in the Fort Hood area by practice tank maneuvers. The 171-mile microwave route requires only six stations, as shown in Fig. 1, but it provides a microwave nucleus which can be expanded as required along the pipeline right-of-way either to the east or to the west.

The main offices of Atlantic Pipe Line Co., crude division, under J. Harry Wood, vice president and general manager, are located in Dallas. The pipelines controlled from here transport crude oil for a number of major oil companies from the Midland, East Texas, and Louisiana fields to refineries and marine terminals at Atreco (Port Arthur) and Harbor Island (Corpus Christi).

All of the pipeline operations are headquartered in Dallas. The dispatcher's office has direct contact with the pump stations and terminals in Texas, Louisiana, and New Mexico for controlling all phases of the pipeline operation.

Turnkey Installation

Atlantic's new microwave system was a complete turnkey installation. Atlantic furnished the initial system planning and the station sites. The manufacturer provided the system engineering, manufactured equipment, installation, and personnel training. The equipment included the radio, multiplex, Rycom carrier, towers, antennas, and complete buildings.

An extensive study of the topographic maps of this area of Texas was made to establish path profiles which would allow the 171-mile system to be constructed with only three terminals and three intermediate stations. One of the paths involved, from Hillsboro to Oglesby, is 50.10 miles long—something of a record for the flat lands of Texas.

The sites selected by the paper survey were checked by a field survey. The tower heights selected from the paper survey proved surprisingly accurate, but subsequently it was necessary to reduce the 300-ft. tower at Hillsboro to 220 ft. to avoid interference with the commercial air lanes. It was possible to increase the antenna sizes on the paths to this tower to compensate for the loss experienced with poorer clearance. This allowed us to avoid an extra station in the 50-mile path.

Base Band Amplifier Permits Direct Connection to Existing Wire Lines

The multiplex equipment base-band amplifier employed in this system provides a broad-band coverage from 300 to 500,000 cycles. The lower frequencies of this band were used for the service and fault channel and for the direct application of the channels

Author is manager of communications, Atlantic Refining Co.

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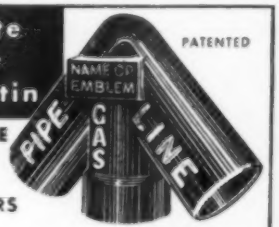

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DISPATCHERS C. L. Owen and J. E. Sanford control vast pipeline network for Atlantic.

COMMUNICATIONS Superintendent Frank Geisel checks the new equipment.

provided by the Rycom carrier equipment. Additional circuits were equipped with multiplex equipment. This equipment provides channels which may be interchanged simply by switching the plug-in crystals. The resulting circuits have the high stability required for frequency-shift telegraphy, telemetering, and facsimile.

All circuits employ the standard-side band, suppressed carrier technique which has long been accepted for its efficient utilization of spectrum space. No synchronization is required in this system. It is possible to extract circuits at any location on a building-block basis without any requirement for extensive common multiplex equipment in the lower 24 channels of the system.

Microwave System Already Proves Its Worth

During the installation period one of the heavy spring floods inundated large sections of the existing wire line. At that time, only the service channel was in operation over the microwave system, but this was pressed into service to provide emergency communications to the wire lines at Temple and Evant.

Plans for Future Expansion

The present communications system is used primarily for various types of voice communications. However, with the elimination of the communications bottleneck between the pipelines and the home office, the company can readily expand its operations to provide for telemetering, facsimile, VHF radio control, etc. This increased utilization of communications facilities should provide economic dividends as well as improved reliability and convenience. **End.**

Helicopters Used for Pipeline Inspection

WHAT'S the best way to patrol 2,000 miles of pipelines through West Virginia's hill country? Should you walk the lines of fly them? And is plane or helicopter the best solution over routes which have rapid changes in elevation and shifting air currents?

Hope Natural Gas Co. uses a combination of aerial and ground patrol. For aerial patrol, helicopters are re-

Pipeline Patrol

HELICOPTERS are more expensive than small airplanes but they are ideal for line inspection in hilly country.

lied on exclusively even though they are many times as expensive as airplanes. With no previous aerial-patrol experience, Hope Natural started flying its lines in November 1955. Helicopters were chosen largely because of the terrain which made flying a plane at low altitudes tricky to say the least.

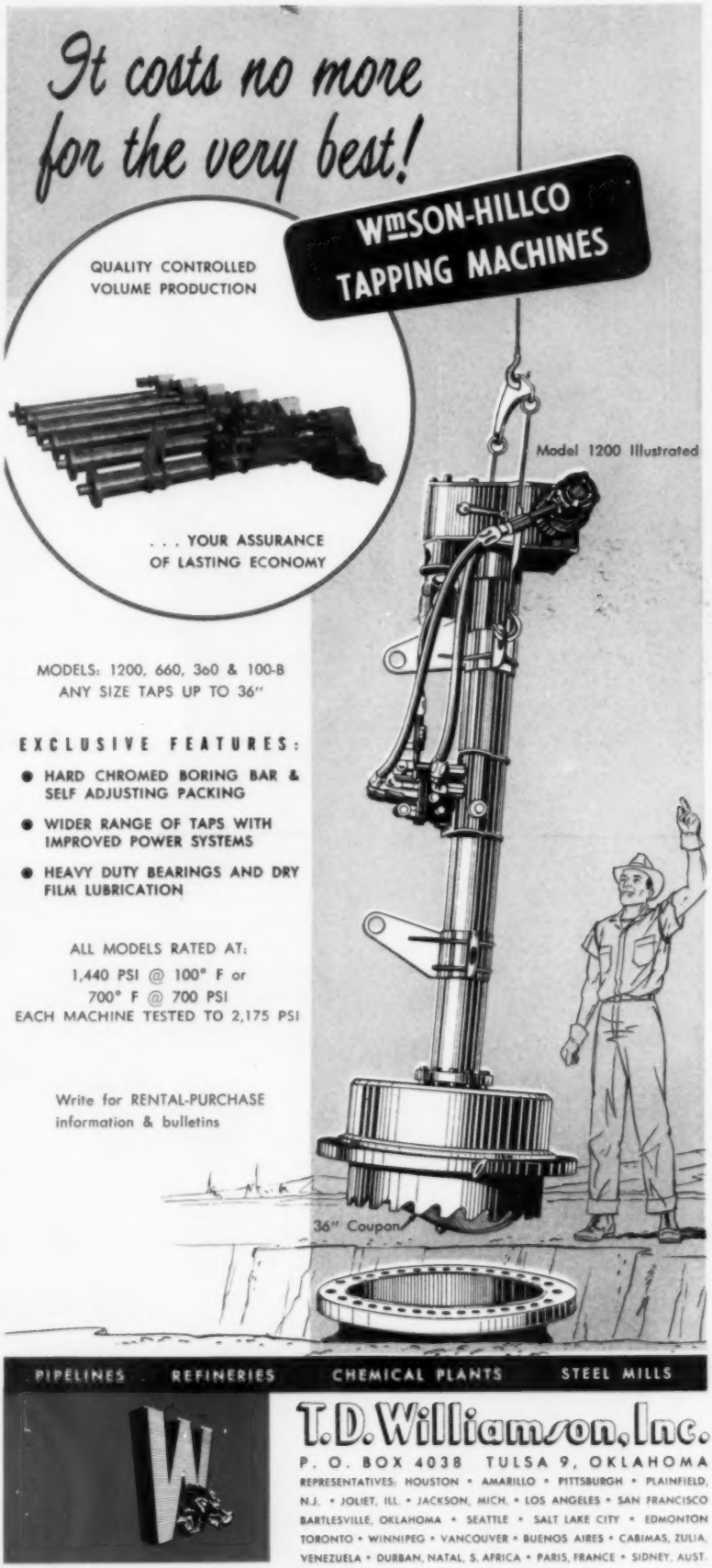
The company is patrolling 2,000 miles of line at a cost of $1.55 per mile. Airplane patrol, if it were practical in this terrain, would cost 52 cents per mile, according to Hope Natural. Foot patrol costs $2.20 per mile. The helicopter patrol covers 28,800 miles per year. The patrol service which has the contract to fly the lines uses a single helicopter for the job. A spare unit is pressed into service in case of emergency or breakdown. Flights are made at 35 to 45 miles per hour, about half the speed of airplane patrol, and at 200 ft.

How often each line is patrolled depends on the type of construction and age of the line. Dresser coupled lines are patrolled once a week, older welded lines once every other week, and newer welded lines once a month.

Flight routine . . . The pilot has his hands full maintaining altitude and speed in the mountains. So a full-time observer is employed.

On a typical patrol, the observer gives the main office a flight plan of the lines to be covered on that day. During the patrol he is in radio contact with the main office. He checks with the office as he reaches pipeline junctions or compressor stations.

The observer reports leaks, washes, slides, coal-stripping operations close to the line, or other construction, or natural terrain changes which could affect the system. Leaks are detected by the usual signs of dead vegetation, ground discoloration, and shadows of gas vapors. When a suspected leak has been found, it's possible to land the helicopter nearby and inspect it closely. When bad weather covers the entire system, patrol flights are canceled and made up on weekends. **End.**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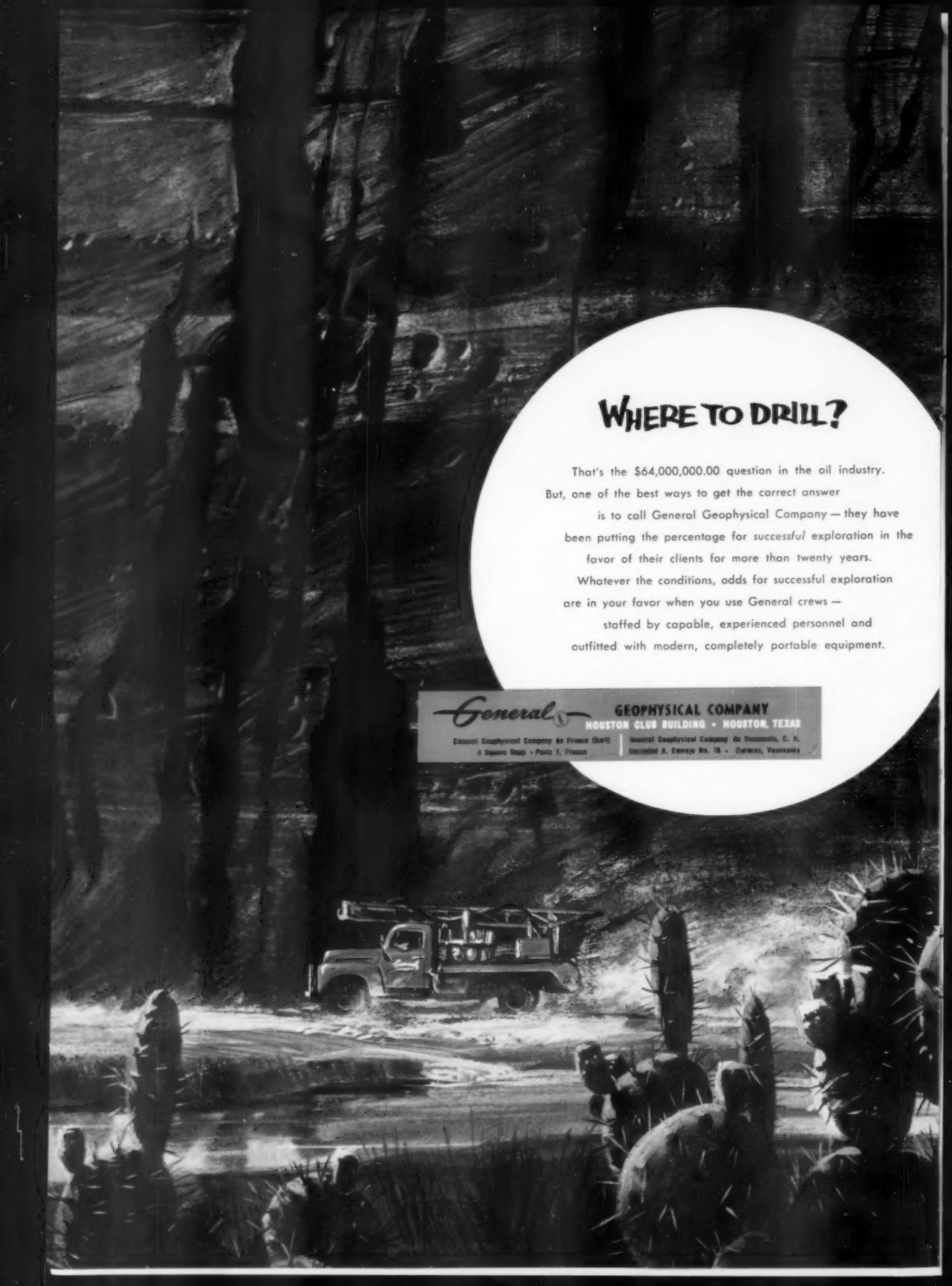
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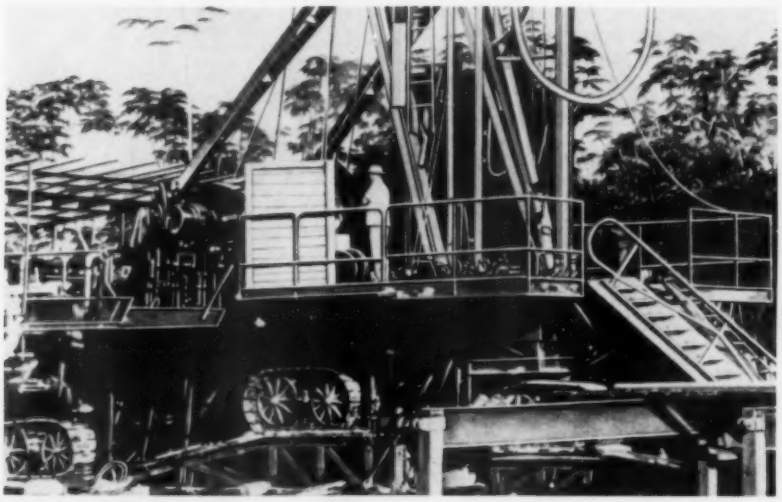

TRAILER-MOUNTED RIG on remote deep exploratory test drilled by The Texas Co. in wilds of eastern foothills of Peruvian Andes. Note track-laying suspensions which replaced wheels under the trailer.

Light Trailer-Mounted Rig Drills Deep Peru Test

A trailer-mounted rig which, under normal conditions, would be used for drilling within the 3,000 to 5,500-ft. depth range recently carried an exploratory test to 11,537 ft. without serious trouble.

Location of the test in an almost inaccessible area, La Zona Del Oriente, at the eastern foothills of the Peruvian Andes made the feat all the more remarkable.

Getting into the location with a much larger and heavier rig would have been extremely difficult, if not impossible. Even with this relatively light rig, the problems of access were great.

Although the area is within 250 miles of Peru's west coast, the only access for the rig was by the Amazon River from the east coast of Brazil. The rig could not be transported over the Andes between the location and the Peruvian coast.

The haul from the Brazilian east coast was made on a converted LST navigating the entire length of the Amazon and part of the Rio Maranon, a trip of about 3,000 miles.

Because of the extremely swampy terrain, matting had to be laid to support the weight of the rig as it was rolled from the LST at the river head to the inland well site. The trailer was provided with track-laying suspension instead of wheels to give better traction and support.

The rig had a National T-32 draw works with a special drive unit powered by five engines. Drilling was with 3½-in., 10.2-lb. drill tubing using 168 6¾-in. bits, 2⅝-in. bits, one 15-in. bit, and 16 core heads. The 15-in. bit made the first 22 ft. of hole for 13⅜-in. conductor pipe. The 9⅝-in. bits carried the hole to 1,576 ft. for 7⅝-in. surface pipe. The 6¾-in. bits drilled the remaining hole, open to total depth.

The Texas Co., which drilled the test, planned to run 5-in. casing in the 6¾-in. hole for completion if it found production, but the hole proved dry. However, the main purpose of the venture was one of subsurface exploration.

Ocean Drilling Co., New Orleans, will do the drilling on Shell Oil Co.'s new offshore wildcat test in Block 111, Vermilion area, Gulf of Mexico. Location is about 30 miles off the coast of Vermilion Parish. Planned depth is 11,000 ft.

Nicklos Drilling Co., Houston, has contracted with Frankfort Oil Co. for a 12,000-ft. test to be drilled at a wildcat location, north of the operator's discovery well of Alson field, 10 miles north of Baton Rouge field, in East Baton Rouge Parish, South Louisiana.

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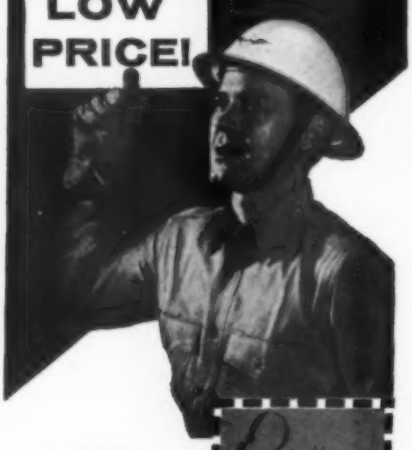

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The new location is for 1 Barber, in 63-5s-1w. Frankfort's discovery well was completed last January as an oil producer from a 10,100-ft. sand.

Ruhl Drilling Co., Houston, has a rig working for Trice Production Co. at a wildcat location 10 miles north of Athens, in northern Henderson County, East Texas. Location is at 1 Craig, in the James Ball Survey. Drilling is projected to the Travis Peak about 9,200 ft.

Glasscock-Wilson, Inc., Shreveport, has a new wildcat operation in Evangeline Parish, South Louisiana. It is a contract job for J. Robert Phillips, Jr., of Dallas. Location is at 1 Delta-Fontenot, in 23-4s-2e, about 1¼ miles south of Ville Platte field, in the eastern part of the parish. Contract is for a 10,000-ft. test.

Lake Charles Drilling, Inc., Lake Charles, La., is under contract for an 8,600-ft. Frio test in the South Duralde area, southwestern Evangeline Parish, South Louisiana. Operators are Alvin M. Jackson and M. F. McCain, of Shreveport, with the contractor holding an interest. Location, at 1 Fontenot, in 38-6s-2w, is about 2 miles southwest of the field's discovery well, nearest production.

Zach Brooks Drilling Co., El Dorado, Ark., has contracted for a 10,000-ft. wildcat to be drilled east of Eagle Bend, in southern Issaquena County, in eastern Mississippi. The test, Launius-Meyer 1 Kelsey-Hayes, in 19-18n-3e, is about 12 miles southwest of the new Valley Park field, nearest production.

Cardinal Drilling Co. is on a newly started wildcat operation in northern Renville County, North Dakota. It is a 4,700-ft. test for North Central Oil Co. at 1 Walker, in 23-163n-84w. Location is about 12 miles east of the Bluell area, and about 8 miles south of the Canadian border.

Globe Drilling Co., Tyler, has two new wildcat operations going in East Texas. The latest is a 7,000-ft. contract for Roger Stewart and associates, of Corsicana, Tex., at 1 Keils, in the Keechi area, 6 miles northeast of Buffalo, in northern Leon County. This location, in the John S. Carson Survey, is about 3½ miles north of Buffalo field, nearest production. The other job is a 6,000-ft. Woodbine test for J. S. Mitchell, of Houston, 6½ miles southeast of Palestine, in southeastern Anderson County. The test is listed as 1 H. E. Mallard Estate.

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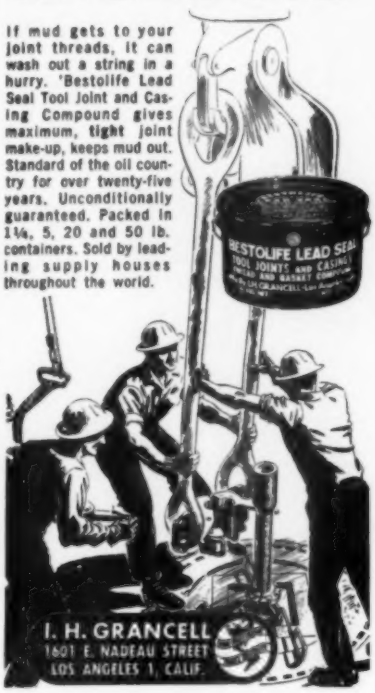

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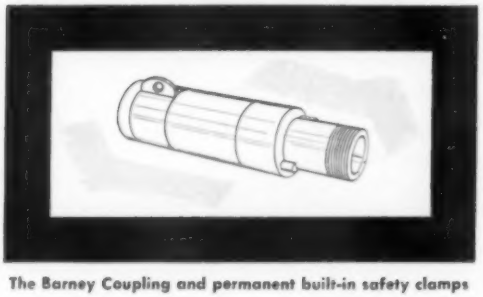

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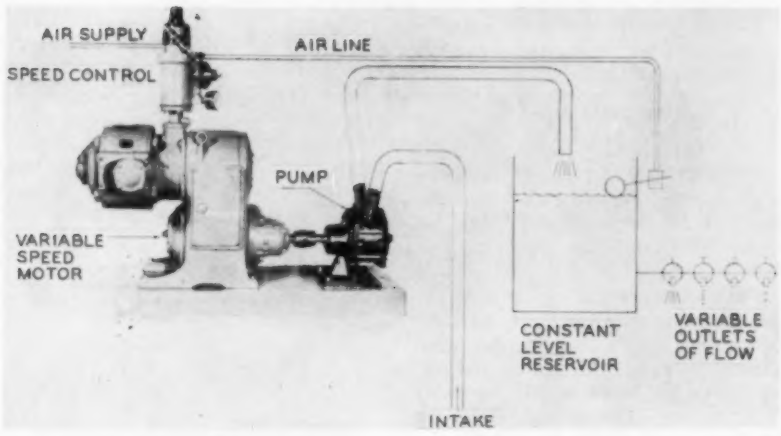

New Pump Motor Provides Variable Flow

Where controlled and varying rates of flow of corrosive fluids and abrasive slurries are required, this new variable flow rate pump-motor set designed specifically for pilot-plant, laboratory, or process work can be valuable, according to the maker. With the pump driven by a variable-speed power source, a relatively linear relationship can be obtained between speed and output.

Several means of obtaining variable speeds are provided. One is a simple hand-operated variable-pitch pulley arrangement. Another is an integral variable-speed motor drive in which provision is made for automatic process control by using an air cylinder to set the speed of the drive.

An air signal operating at an instrument pressure of 3 to 15 psig. is the sensing and controlling portion of the system. Signal pressure controls the power air through an amplifier, thus controlling the speed of the pump drive. The pump is self-priming. Flow rates from fractional to 40 g.p.m. are available. **Write or call: Vanton Pump & Equipment Corp., 201 Sweetland Avenue, Hillside, N. J., for details on variable flow-rate pump-motor set.**

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Nickel-Alloy Coatings Up Process-Piping Resistance

Protection for ferrous materials in corrosive refinery and petrochemical-plant service is provided by these new Niphos nickel-alloy coatings, the maker reports. They can increase the service life of tubing and pipe subjected to highly corrosive agents in plant piping systems and heat-transfer equipment.

After application, the coating is fused by beating in a reducing atmosphere into protective nickel-alloy cladding. The coating or cladding actually forms an interface with the base metal. It adheres to the metal so no evidence of flaking or peeling is encountered, even after 180° bends, the maker reports.

Since the coating provides effective heat resistance to temperatures as high as 1,150° F., it prevents scaling of the base metal. When properly welded, coated areas are said to suffer no loss of corrosion resistance in the weld-affected area. **Write or call: Tube Reducing Corp., Wallington, N. J., for details on Niphos coatings.**

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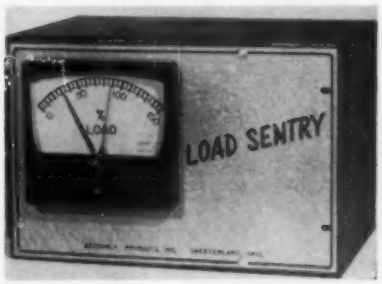

Motor Overload Control Shuts Off Motor

Continual indication of motor load and adjustable load limits are provided by this new Load Sentry electro-mechanical control for use where overload may be registered on an electric motor. The control is built around the positive action of a contact meter-relay. Employing no electron tubes, it is easily hooked into start-stop switches, the maker says.

The maximum load permitted on the motor being monitored is set by an

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STOP H_2S CORROSION BEFORE IT STARTS!

• The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

CONNELLY, Inc.
3164 SOUTH CALIFORNIA AVENUE
CHICAGO 8, ILLINOIS
ELIZABETH, NEW JERSEY

SHOWCASE . . .

New Equipment

adjustable pointer on the meter-relay dial. The dial has 30 easily read divisions. These range from 0 to 150 per cent of normal load.

Another pointer indicates the actual running load on the motor. When the pointers meet at an overload position, contacts lock and the circuit is broken. The control then sounds an alarm and/or shuts down the system.

Normally, the control is furnished to operate on alternating current. Units for a wide range of amperage are available. They differ only in their transformers.

The control may be moved from one motor circuit to another of different capacity by simply changing the transformer. It is built to ignore starting-current surges. **Write or call: Assembly Products, Inc., Chesterland, Ohio, for details on Load Sentry for motors.**

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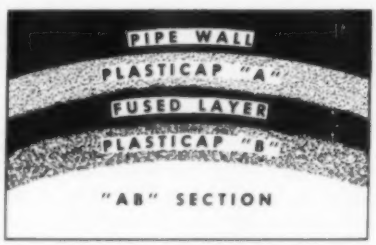

Baked-On Plastic Coating Prevents Corrosion

Two types of films are combined in this new composite baked-on plastic film for field tubular goods to achieve high resistance to acid and alkali attack and unusual flexibility and impact strength. Called Plasticap AB, the film is a combination of phenolic and modified phenolic baked-on plastic.

According to the manufacturer, it is particularly valuable for use in gas condensate, sour-crude, and high-pressure sweet-crude wells, wells making salt water, and salt-water disposal and water-flood systems.

Dual strings are said to offer no complications with the baked-on plastic coating. Each string is individually protected by its own internal coating, without modification of conventional oil-production processes. The smooth hard surface of Plasticap AB is said to provide reduced frictional resistance to flow. **Write or call: Plastic Applicators, Inc., P. O. Box 7631, Houston, Tex., for details on Plasticap AB.**

Tank-Lining Material Comes in Three Types

Here's a new line of neoprene, natural rubber, and Hypalon sheet designed for tank lining and abrasion-control. The materials are reported to combine excellent chemical resistance with good handling and storage characteristics in either vulcanized or unvulcanized form.

Also available is a line of cements, primers, and liquid coatings necessary for sheet installation or repair of existing linings. **Write or call: Chemical Coatings & Engineering Co., Inc., Edgemont, Pa., for details on tank linings.**

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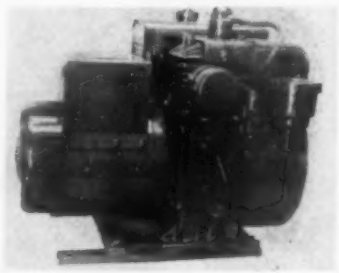

Portable Electric Plant Offers 1,500 Watts

A portable supply of electric power can be obtained with this new self-contained electric plant. It develops 1,500 watts of 110-volt, a.c. power and takes up less than 2 sq. ft. of space, the maker reports.

Powered by a one-cylinder air-cooled engine, the Model 31-B plant has two convenient twist-tight outlet receptacles for connecting lights, appliances, or

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"Custom-Built for the South"

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Up-to-date facilities and methods at Levingston make it possible for you, "Mr. Oil Operator," to get what you need in marine drilling equipment. The best men in the business direct the operations at Levingston. Modern facilities and new methods insure economy, speed, and quality in the finished product.

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SHURKURE

Shur-Kure contains various size particles of nylon, cotton, rayon, synthetic rubber and crude rubber.

Shur-Kure is packed in all-weather bags, easy to handle, mix and store. Shur-Kure is low cost, high allowance concentrations —no adverse effects to mud, no harm to product by action of pumps, guns, jet bits, etc.

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PART 1 A series on problems of stuffing box packing.

J-F . . . Perfect Pumping Package

BASIC CONSIDERATIONS

1. PACKING
2. Rod
3. Alignment

The following packing characteristics are the result of 9 years' development by J-F:

1. Long life
2. Practically frictionless
3. Pressure type seal which operates with minimum HP loss

J-F Cone seal packing is made of oil-resistant Hycar with a wear-surface of long-lasting nylon. All rings are identical, eliminating the chance of improper packing.

The combination of nylon and Hycar does several things. Nylon is not affected by well fluids and, in fact, the well can be run several hours without lubrication without burning the packing. Frequent tightening is no longer necessary to maintain a seal since sealing is obtained by well pressure against the packing ring lip.

So successful is this combination that several automatic pumping leases are now equipped with J-F Stuffing Boxes. The pumper visits these wells at 2 to 3-week intervals. Specific details on these operations available on request.

JOHNSON-FAGG, INC.

Oil Field Pumping Specialists
54th & Garnett Road Phone Riverside 2-3337
P. O. Box 7157 Tulsa, Oklahoma

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power tools. All electrical equipment is enclosed.

Providing push-button starting, it has a special 12-volt winding on the generator that acts as the starter and also provides 300 watts of 12-volt power for battery charging. **Write or call: Universal Motor Co., 441 Universal Drive, Oshkosh, Wis., for details on Model 31-B plant.**

•

Portable Radio Telephone Built for Geophysical Use

Developed for geophysical applications, this new Kaar TR-245-P portable radio-telephone may be used on any single frequency between 2,000 and 8,000 kc., the maker reports. Transmitter power output is from 25 to 30 watts.

The unit may be operated directly from a 6 or 12-volt battery. Quick-heating tubes are said to keep current drain low. Including the carrying case, the unit weighs only 52 lb., less battery.

A stripped chassis is provided. Thus, users may add special equipment for time-break circuits as employed in geophysical operations. Facilities for auxiliary inputs are also provided. **Write or call: Kaar Engineering Corp., P. O. Box 1320, Palo Alto, Calif., for details on TR-245-P radiotelephone.**

•

Water-Treating Chemical For Water Floods

This new product is a multipurpose chemical formulation suited for operations where combinations of scale, corrosion, and bacteria are contributing to the malfunction of flood or disposal systems, the maker claims. It is considered particularly useful where incompatability of treating agents may cause complications when two or more forms of attack are involved.

It functions in four ways: (1) as a

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DRILL STEM TESTING

For more information about the potential of your well, a Halliburton Testing String will furnish you with evaluation data quickly and economically.

Every Halliburton Testing String is a coordinated team of modern tools, each designed to work most efficiently with the others for faster, more accurate results.

And behind every Halliburton Testing String is Halliburton research—research to provide superior testing tools and techniques for today's requirements and even better for the demands of tomorrow.

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

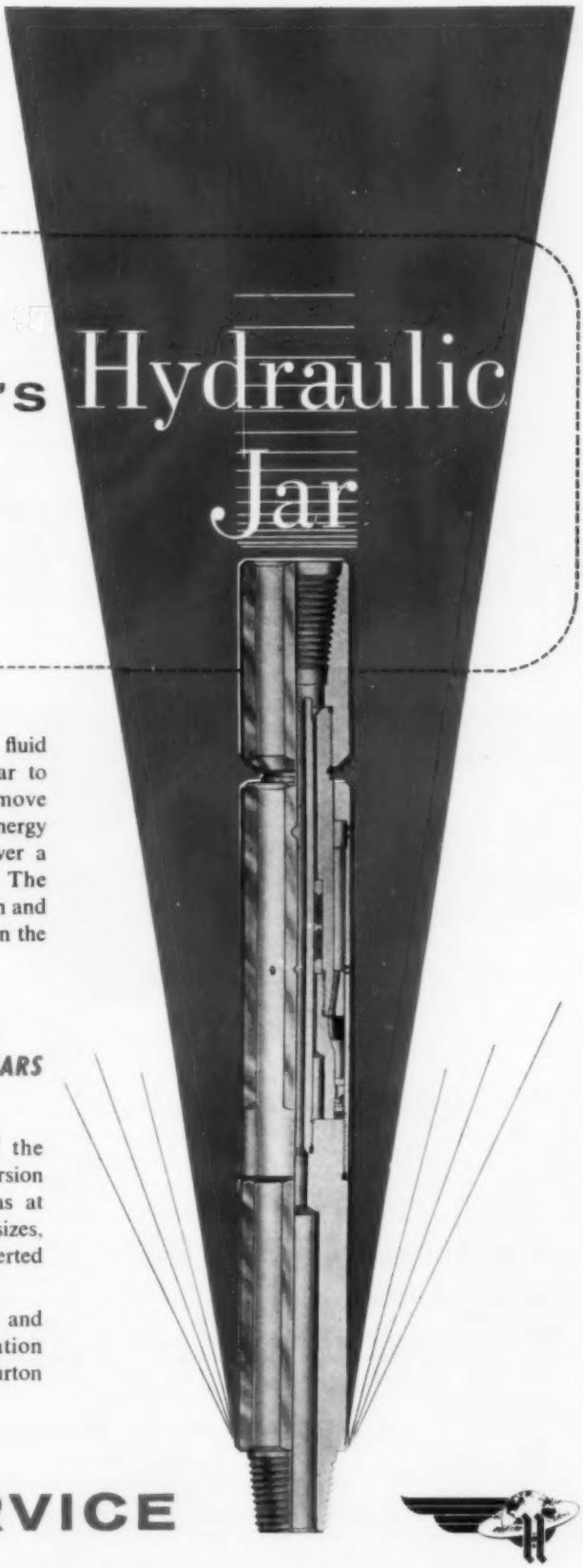
a common problem:

To unseat and release stubborn packer or anchors after completion of drill stem testing.

the solution:

HALLIBURTON'S Hydraulic Jar

Shortest, easiest handling jar available. Utilizes hydrostatic pressure of well fluid to deliver a blow to the stuck packer or anchor.



An upward pull against the weight of the fluid column causes the hydraulic system of the Jar to release suddenly, allowing the mandrel to move quickly. The tension in the pipe supplies the energy to cause the shoulder on the mandrel to deliver a sharp blow to the stuck packer or anchor. The Hydraulic Jar can be cocked and re-cocked again and again merely by slacking off pipe weight, as when the packer is set.

NEW CONVERSION PARTS FOR HALLIBURTON HYDRAULIC JARS

Still further flexibility and efficiency of the Hydraulic Jar have been effected by new conversion parts which allow for smaller differential areas at greater well depths. On both the 3⅞" and 5" sizes, differential areas of the Jars may be easily converted by the substitution of minor alternate parts.

Halliburton offers you a complete, reliable and economical testing service. For more information about the potential of your well, call your Halliburton Tester.

TESTING SERVICE

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY WELL

SHOWCASE . . .

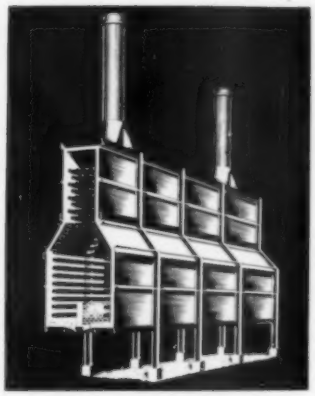
New Equipment

wetting agent to reduce interfacial tensions, and conditioning the formation surface, allowing the formation to receive water in less time and at lower injection pressures, (2) to kill sulfate-reducing bacteria, preventing formation plugging, (3) to inhibit corrosion, and (4) to aid in deflocculation of solids. Write or call: **Tretolite Co., 369 Marshall Avenue, St. Louis 19, Mo., for details on Fludex.**

Tubular Heater Comes In Three Sizes

This new Selas Econotherm heater, a tubular heater for noncritical continuous processing in refineries and petrochemical plants, is offered in a standardized design instead of the special units previously furnished, the maker announces.

Intended for applications where heating is accomplished below decomposition temperatures, the heater can be obtained prefabricated for field serice or completely shop-assembled. It's available in three configurations to accommodate processing requirements of 8 to 17 million B.t.u. per hour, 17 to 30 million B.t.u. per hour, and over 30 million B.t.u. per hour. **Write or call: Selas Corp. of America, Dresher, Pa., for details on Econotherm heater.**



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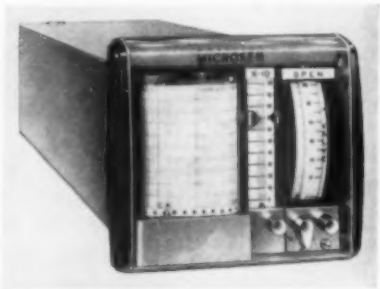


Electronic Controller Allows Fast Changeover

Here's a new electronic controller that can be interchanged at the panelboard in a few seconds, according to the manufacturer. It allows changeover from a recording to indicating type, proportional action to proportional-plus-reset action, or slow reset to fast reset. To replace a unit, simply pull one out and plug the other in. The recording controller is called the Series C110; the indicating type, C120.

Controller settings are calibrated and repeatable. When the controller station is replaced, the proportional, reset, and rate settings can be made in advance so the process is on control the instant the changeover is completed. **Write or call: Manning, Maxwell & Moore, Inc., Stratford, Conn., for details on Series C110 and C120 controllers.**

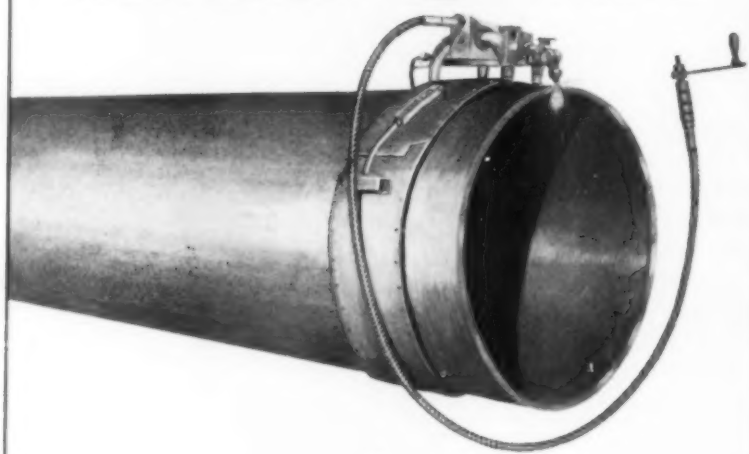
●

Gas Detector Locates Pipeline Leaks

Natural-gas concentrations from 0 to 100 per cent gas can be measured with this new portable gas detector, the

BEVELS 6" PIPE

BEVELS 48" PIPE



C-R-C IMCO BEVELERS fit all pipe sizes 6" to 48" O. D., cut perfect bevels, and out-of-round pipe, too. Single lightweight unit does work of several, costs you less to buy and use.

ONE BEVELING KIT FOR ALL YOUR JOBS!

For additional information see page 108, Pipeline Composite Catalog.

The CRC IMCO Pipe Beveling Kit contains a complete range of bands for beveling a variety of pipe sizes. With this convenient selection of sizes, the operator need only make one trip to handle all pipe beveling requirements including back beveling. The sturdy steel case and number of bands are optional.

CRC

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FOR OVER 20 YEARS the versatile Cleveland "110"...here's one working on a gas gathering line for Phillips Petroleum in McClain County, Okla.... has been a fast dependable trencher on gas, oil, and product pipelines of all types, to 24 inches wide and 5½ feet deep ... trunk lines, gathering lines, field lines, lease lines. Built tough and compact, the "110" is a perfectly balanced combination of practical, performance-proved features ... a trencher of superior digging ability in all types of soil and terrain. It digs more trench in more places at less cost.

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the famed Top O' the Columbus —gourmet food; cocktails; supper dancing; panoramic views of ocean, bay, and city!

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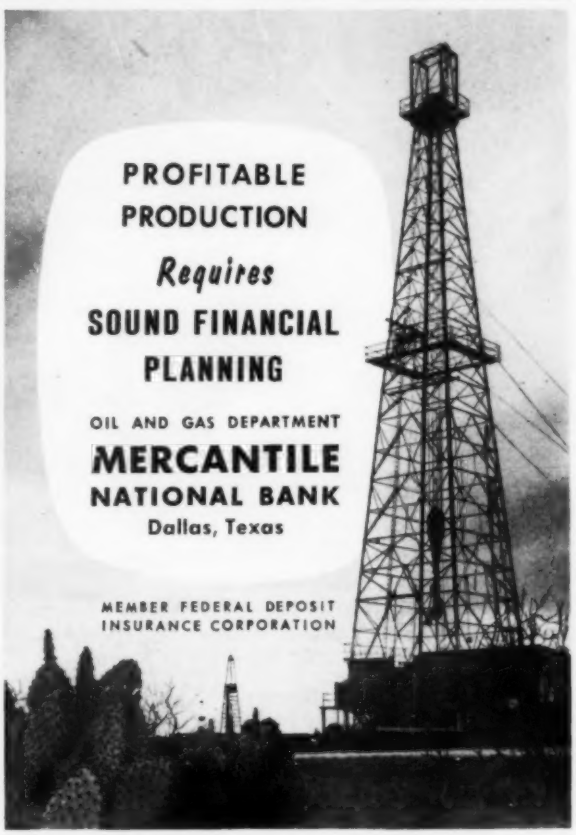
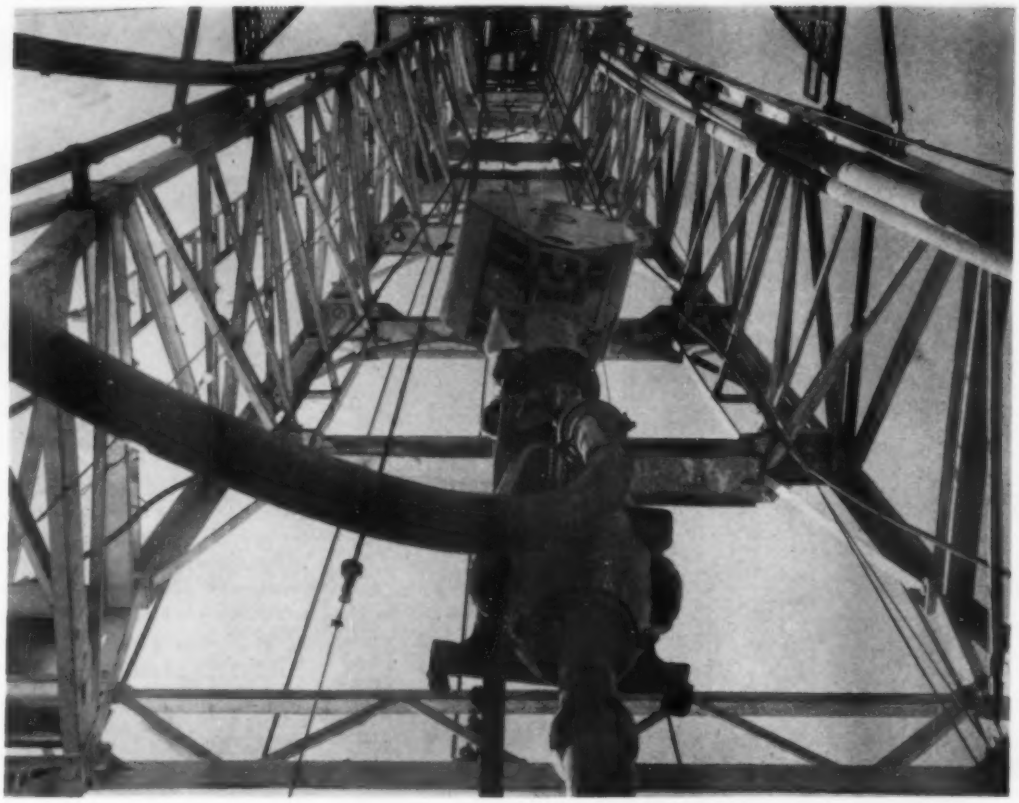
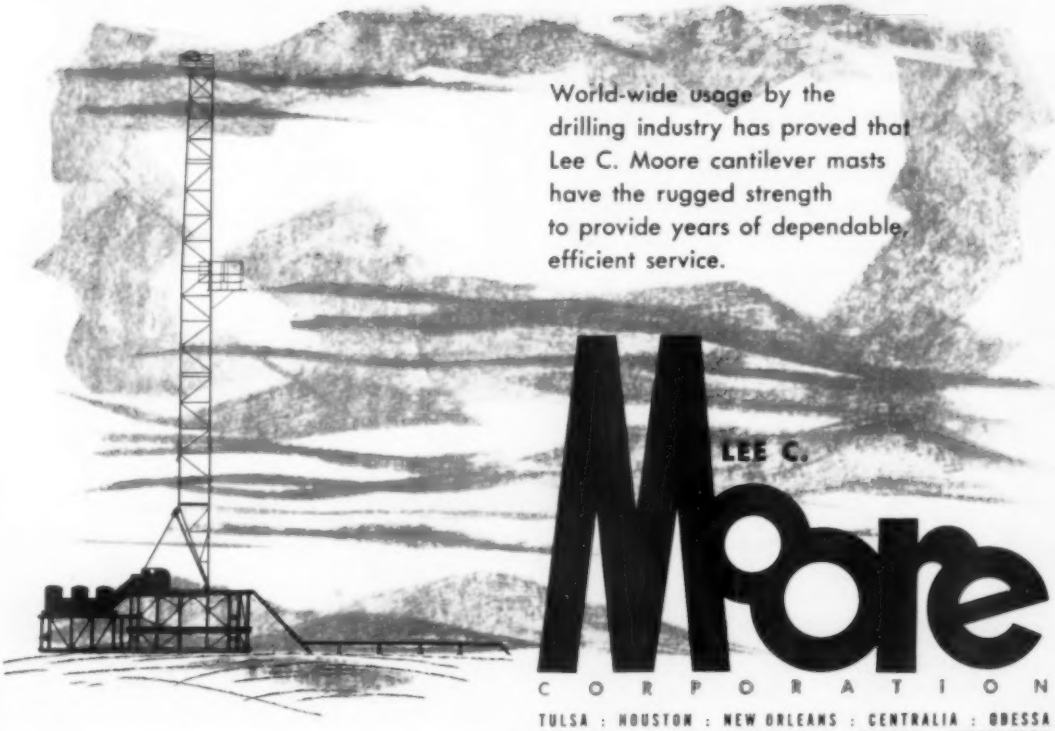




RUGGED STRENGTH



World-wide usage by the drilling industry has proved that Lee C. Moore cantilever masts have the rugged strength to provide years of dependable, efficient service.

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FOREIGN LICENSED MFR.: OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND

New Equipment

maker reports. Termed the Gas-Pointer, the detector is designed for pinpointing leaks in buried pipelines. It also may be useful for testing manholes and valve boxes or as a general-purpose combustible-gas indicator.

Two ranges are built into the instrument—low and high. In the low range, the meter registers from 0 to 1.0 lower explosive limit. If the gas concentration is above this range, a two-position valve can be turned to a 0 to 100 per cent range for direct reading of gas concentration on a second meter scale.

Low-range indications are obtained by catalytic oxidation on a platinum filament. High-range indications depend upon thermal conductivity from a noncatalytic filament.

Weighing only 5 lb., the instrument measures 3 by 4⅜ by 5¾ in. It's fabricated from die-cast aluminum and fiberglass. **Write or call: Johnson-Williams, Inc., 2781 Park Boulevard, Palo Alto, Calif., for details on Gas Pointer.**

●

Fluid Cooler Suited For Water-Short Plants

Here's a new induced-draft horizontal air-discharge dry type of fluid cooler designed especially for steam condensing, hydrocarbon condensing, jacket-water cooling, oil cooling, and gas-cooling applications in gas-transmission stations, refineries, petrochemical plants, and natural-gasoline plants, the maker reports. The unit comes in nine sizes with a capacity range from 1 to 10 million B.t.u. per hour.

The induced-draft cooler consists of three basic components: (1) one or more extended-surface heat-transfer coils with a mechanical fin-to-tube bond, (2) a propeller fan with drive, and (3) a steel support structure.

Using ambient air, it cools fluids in a closed system. Because it requires no water, the cooler is suited particularly for areas where water is at a premium.

Either liquid or vapor can be cooled or condensed from a maximum of 800° F. to a final temperature of 20° F. above ambient temperature at working pressures up to 1,000 psi.

Features cited for the unit include: (1) an automatic or manually controlled-pitch fan, (2) vibration-free operation, and (3) motor and fan-drive installation outside the hot-air discharge in accessible waist-level location. **Write or call: Trane Co., La Crosse, Wis., for details on induced-draft fluid cooler.**

PIPELINES are NOT SIDELINES with
WILLIAMS BROTHERS
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NBT BLDG. • TULSA, OKLAHOMA
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almost

To handle any lifting job...

twelve dependable Duff-Norton Hy-Power Hydraulic Jacks

capacities 3 to 100 tons

Rugged and dependable, Duff-Norton Hy-Power hydraulic jacks are available in a wide range of sizes for all kinds of lifting jobs—in all types of industries. Manufactured with care from the finest materials, they will function smoothly for many years with a minimum of maintenance. Heads may be brought up to load height quickly, saving the operator's time. For full information on these outstanding jacks, see your favorite supply store or write the world's oldest and largest manufacturer of lifting jacks, asking for Bulletin AD-16-B.

Duff-Norton Jacks

DUFF-NORTON COMPANY

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION: Danville, Illinois

Ratchet Jacks, Screw Jacks, Hydraulic Jacks, Special Worm Gear Jacks, Ratchet Hoists, Electric Hoists, Load Binders, Spur Gear Hoists

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HIGH PRESSURE GAUGES

USED IN
REFINERIES
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THROUGHOUT THE WORLD

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REFLEX
Single or Multiple Sections

TUBULAR

Gauge Cocks
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Heated or Cooled Gauges

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SHOWCASE . . .

New Literature

Mechanical Seals and Sealing Systems for boiler-feed and other hot-water pumps are pictured and described in this new four-page bulletin (Form S-230). Schematic drawings and photographs illustrate a boiler-feed-pump sealing arrangement and a piping arrangement. The bulletin points out the advantages of the sealing systems. The advantages given include increased service life, positive sealing, and low maintenance costs. **Write or call: Crane Packing Co., Dept. OJT, 6400 Oakton Street, Morton Grove, Ill., for Form S-230.**

●

Indicators and Recorders for temperature and pressure are described in this new four-page brochure. The instruments, for service in petroleum and petrochemical plants, include both straight and angle-adjust thermometers in both dial and bulb types as well as pressure gages in single and duplex types. The recorders for both pressure and temperature are made in 8, 10, and 12-in. sizes and in a combination pressure-temperature recording type. **Write or call: Weksler Thermometer Corp., 165 East Merrick Road, Freeport, L. I., N. Y., for bulletin on indicating and recording instruments.**

●

Water-Suction and Steam Hose are the subjects of these two new catalog sections. The water-suction hose section consists of four illustrated pages that provide operating data and specifications on five types of water-suction hose for industrial use. It also provides coupling data. The steam-hose section is a two-page illustrated leaflet that explains operating and specification data on five types of steam hose. It also includes coupling information. **Write or call: B. F. Goodrich Industrial Products Co., 500 South Main Street, Akron, Ohio, for leaflets on water-suction and steam hose.**

●

Stainless and High-Alloy Steel Pipe and Tubing. A 48-page manual, describes Trent Tube products ranging in size from ⅛-in. to 40-in. o.d. Separate sections in the new manual describe pipe and tubing for use in high pressure applications, heat-resistant tubing, mechanical equipment, and shaped and formed tubing. The catalog also covers large-diameter tubing for such uses as waste disposal systems in chemical plants, exhaust stacks, and other applications. A separate section devoted to titanium tubing outlines its special advantages.

The catalog supplies 17 hardness, conversion, size range, corrosion, gage, and other tables plus a glossary of tubing terms and helpful facts to aid customers in selecting the proper pipe or tubing. **Write or call: Trent Tube Co., East Troy, Wis., for manual on stainless alloy steel pipe and tubing.**

●

Heat Exchangers Catalog (16 pages) contains a comprehensive engineering section devoted to heat-exchanger design and specification. It includes formulas, heat-transfer coefficients, and charts for sizing and selecting a heat exchanger. **Write or call: Condenser Service & Engineering Co., Inc., 150 Observer Highway, Hoboken, N. J., for heat-exchanger catalog.**

●

Liquid Hypalon, a maintenance coating for extreme chemical and heat resistance up to 350° F. and down to —40° F., is the subject of this new four-page brochure. It gives directions for applying the coating along with a chart comparing the chemical resistances of hypalon, neoprene, and natural rubber. **Write or call: Wilbur & Williams Co., 130 Lincoln Street, Boston 35, Mass., for brochure on liquid Hypalon.**

NEW
SINGLE PHASE 10, 15 and 20 HP
R & M "All-Weather-40"
Oil Country MOTORS
Famous R&M "All-Weather-40" motors are now available for single phase operation in sizes up to 20 HP. All auxiliary mechanism is externally mounted for simple inspection and servicing, even while the motor is running. R&M "All-Weather" features protect against moisture and assure dependable operation for years of oil field duty.
A unique part winding "cushion start" system, available as an extra-cost option, provides reduced current starting for sizes above 7½ HP.
Get all the facts now on R&M "All-Weather-40" single phase motors. Write for Bulletin 470-AGJ or call your R&M representative.
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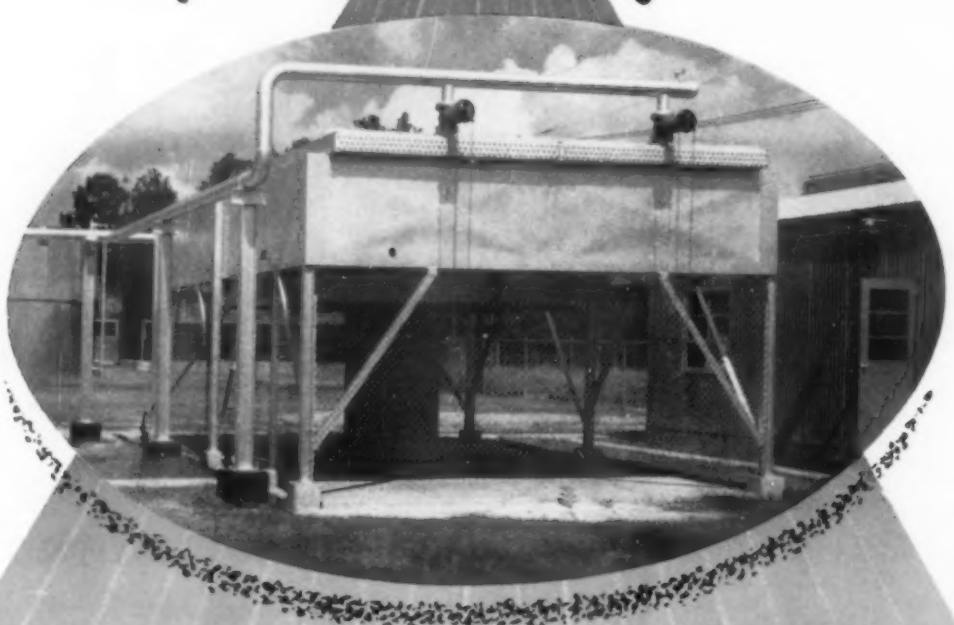
Motor Division • Springfield, Ohio

SMITHCO

Unequalled Performance



From the leading manufacturer of air cooled heat exchangers comes the most advanced designing and highest quality equipment on the market today.

Smithco's extensive background plus their unequalled engineering and manufacturing ability, establish them as leaders in air cooling.

For air cooled heat exchangers of unequalled performance always look to Smithco.

SMITHCO ENGINEERING INC.

P. O. BOX 3171 . . . TULSA, OKLAHOMA

EQUIPMENT MEN . . . in the News

Seven Appointed to New Continental-Emsco Posts

H. C. Fox, G. L. Parks, R. E. Schiebel, Harry Hobbs, Jr., P. J. Allen, Ralph Dodworth and Wendell True have been appointed division merchandise managers by Continental-Emsco Co. Headquartering at Shreveport, La., Fox will serve the Arkansas, North Louisiana, Mississippi, and East Texas division. Parks, stationed at Casper, Wyo., will serve the Rocky Mountain division. Schiebel, Houston, will be division merchandise manager for the South Texas and South Louisiana division. Hobbs, working out of Oklahoma City, will cover Continental-Emsco's Kansas, Oklahoma and North Texas division. Allen, Drayton Valley, Alta., Canada, will head division merchandise activities for Continental-Emsco Co., Ltd. Dodworth, Los Angeles, will head the California division merchandise functions. True, Abilene, Tex., will cover the West Texas and New Mexico division as division merchandise manager.

H. C. FOX

G. L. PARKS

R. E. SCHIEBEL

HARRY HOBBS, JR.

P. J. ALLEN

R. DODWORTH

WENDELL TRUE

According to Roscoe Hambric, general merchandise manager for Continental-Emsco in Dallas, in the new position of division merchandise manager these men will work closely with all stores and offices throughout their divisions. Functions include recommendation of new products, coordination of the introduction of new products and complete working control over stocks of new equipment and replacement parts.

W. C. Norris Promotes Hagaman to Sales Manager

D. P. HAGAMAN

D. P. Hagaman has been promoted to sales manager of W. C. Norris, Manufacturer, division of Dover Corp., according to G. W. Davidson, vice president of sales. Hagaman has been with the company 21 years and since 1956 has been assistant sales manager. Prior to that, he was branch manager and field representative at Salem and St. Elmo, Ill. He returned to the company's Tulsa office in 1954.

Maloney-Crawford Elects Hudson as President

George L. Hudson, Chicago industrialist, has been elected president of Maloney-Crawford Tank & Manufacturing Co., Tulsa, according to Samuel P. Wallace, chairman of the board and former president of the pioneer oil processing equipment manufacturer. At the same time, it was announced that David E. Simpson, Chicago, has been elected vice president of the company and has moved to Tulsa in this capacity.

Hudson also is president of Western Industries, Inc., Chicago manufacturer of railroad supplies and automatic parking gates. Simpson is associated with the Chicago investment banking firm of H. M. Byllesby & Co., Inc., which purchased Maloney-Crawford in August 1956.

J. Patrick Lannan, chairman of Byllesby, recently became a director of another Tulsa company, Burton-Rogers Co., formerly known as Technical Training Aids, Inc.

Cooper Manages Clark's New Orleans Branch Office

JOHN COOPER

Clark Bros. Co., Olean, N. Y., has opened new offices and warehouse facilities in New Orleans, La. According to John Cooper, New Orleans branch manager, the new office and warehouse has been established to better serve the rapidly growing industries of Louisiana, southern Mississippi and southern Arkansas.

Prior to his present appointment, Cooper served in Tulsa as a district sales engineer for Clark.

New Rector Warehouses To Serve Panhandle Area

Rector Well Equipment Co. has opened a new warehouse at Liberal, Kans., with operations on a round-the-clock basis, according to J. L. Pinkard, sales manager. John R. Pinkerton is in charge of the operation. The Liberal warehouse augments services provided out of the company's Great Bend supply and service point.

At the same time, Pinkard announced the opening of a warehouse in Pampa, Tex., with James Wilson in charge of operations. The warehouses at Liberal and Pampa provide service for the complete Texas, Oklahoma and Kansas Panhandle area.

Lane-Wells Opens Two New Offices, Names Appointees

W. C. Vercellino, Gulf Coast division mechanical engineer, has been appointed district sales engineer in charge of the new San Antonio sales office of Lane-Wells Co. Gerald F. Erambert has been appointed district sales engineer at the new sales office in Mount Vernon, Ill., and G. C. Colongne, district sales engineer at Houma, La., has been transferred to Harvey, La., as district sales engineer. In the Mid-Continent division, Harley C Hanselman has been promoted from district sales engineer trainee to district sales engineer at Perry, Okla.

Vercellino joined Lane-Wells in 1950 as a rigman. Prior to his present appointment he worked at Colorado City, Snyder and Houston. Prior to his pres-

ent appointment, Erambert was stationed at Henderson, Ky., as district sales engineer.

Martin-Decker Names Oil Tool Sales Manager

J. W. KNOWLTON

Jack W. Knowlton has been appointed manager of the oil tool division of Martin-Decker Corp., Long Beach, Calif., according to E. L. Decker, president.

Prior to his association with Martin-Decker early in 1956, Knowlton served with Humble Oil & Refining Co. and Richfield Oil Co. As sales manager, Knowlton will be responsible for sales and service of all oil tool division products, both domestic and foreign.

Mercantile National Bank Elects Richard T. Bright

R. T. BRIGHT

Richard T. Bright was elected assistant vice president of the Mercantile National Bank, Dallas, at a recent meeting of the board of directors, according to Milton Brown, president. Bright has been with the bank in the oil department since 1938. Prior to joining the bank, Bright was in the oil business in Tulsa.

Rives, Dyke Is Named P.E.S.A. Advertising Agency

Rives, Dyke & Co. of Houston has been appointed advertising agency for the Petroleum Equipment Suppliers Association, according to W. H. Larkin, chairman of the association's public relations committee.

The association is composed of 150 oil-industry manufacturers, service firms and supply companies with the chief objective being improved efficiency in management, technology, service and manufacturing to accelerate progress in the drilling and production of petroleum.

P.E.S.A. was organized 24 years ago for the purpose of writing a code for the oil-equipment industry under NRA. After NRA, the association was continued to further work with the national government whenever needed. The value of the organization as a vehicle for member companies to work on mutual problems was soon recognized.

Officers of the association are: President, Grover Kilgore, Halliburton Oil Well Cementing Co.; Vice President, W. T. Powell, Continental-Emsco Co.; Executive Secretary, H. R. Stafford, Jr., Houston. Treasurer, Wharton Weems, Houston. Vinson, Elkins, Weems & Searls, Houston are general counsel.

Rives, Dyke & Co. is one of the largest industrial advertising agencies in the South.

Correction of an Editor's Boner

The editor of Equipment Men in the News must have been snoozing last week when page proofs for the August 5 issue went across his desk. At least he let a bad boner creep up on his blind side.

This is what happened. Southern Mill & Manufacturing Co. had submitted a picture of two storm-damaged homes erected by Southern Mill, the only two left standing in Grand Chenier, La., after Hurricane Audrey destroyed the town. We felt that the picture was newsworthy and scheduled it to run, with an appropriate cutline in our August 5 issue.

About the same time Johnston Testers, Inc., announced the establishment of a new service center in Houston. The new Johnston Testers buildings were handsome and we scheduled the picture and cutline to run in the August 5 issue also.

Unfortunately the cutline describing Johnston Testers' new buildings appeared under the picture of Southern Mill's storm-damaged homes. The picture of Johnston Testers' new service center and the cutline describing the miracle of two homes left standing in Grand Chenier, were omitted entirely.

The editor of these pages wants to make it clear that Johnston Testers' buildings are handsome and that there are two Sturdybilt homes left standing in Grand Chenier. Please see the correct pictures with the right cutlines below.—Ed.

Johnston Testers Establishes Houston Service Center

A new installation that gives greater impetus to the service offered by Johnston Testers, Inc., in oil-well formation and casing testing has been put into operation in Houston. The facilities serve as the new Houston district service center and positions the company better to serve oil operators in the areas north, northeast and northwest of Houston. The district center serves an area from Livingston south to the gulf and from Liberty on the east to near Columbus on the west. Johnston's Houston district manager is Dale Ledbetter. Testing specialists working out of the center are Sam Arthur, W. E. Kirkland, and J. B. O'Neal.

Southern Mill Houses Withstand Hurricane Audrey

Southern Mill & Manufacturing Co., Tulsa, builder of industrial housing, is justly proud of the fact that two of its Sturdybuilt houses are the only homes left standing in the community of Grand Chenier, La., after hurricane Audrey leveled the town on last June 27. The two houses, owned by Shell Oil Co., are shown shortly after Audrey blew all furniture out of the houses and scaled away much of the siding. James A. Fish, chief estimator for the sales staff of Southern Mill says the houses will be put back in excellent condition for approximately half of the original cost. Grand Chenier is a community of 500 to 600 people located on the Gulf Coast about 25 miles east of Cameron, La.

Fluid Packed Pump Co. Promotes Sales Executives

VANDENBERG

D. H. Vandenberg has been appointed general sales manager of Fluid Packed Pump Co., according to Sidney Shuman, executive vice president. Vandenberg will be in charge of all the company's sales and service activities.

GLEN PETERS

H. H. PALMOUR

Glen Peters has been appointed manager of distributor sales. Besides coordinating distributor sales, he is in charge of sales and service activities in the Gulf Coast, Southwest, Midwest, eastern, Northwest and Canadian divisions

Harold H. Palmour has been made manager of the Southwest division, succeeding Glen Peters.

Condry Heads Coreco's New Orleans Office

J. T. CONDRY

With the opening of a new southeastern division office at New Orleans, La., Corrosion Rectifying Co. now offers headquarters service from Houston and branches at Great Bend, Kans., and New Orleans, according to Wayne A. Johnson, President.

James T. Condry will direct the evaluation, design, installation, and materials sales in Louisiana and neighboring areas. He has had extensive experience in cathodic protection work for Service Pipe Line Co., and with consulting firms.

McCullough Establishes Four Corners District

McCullough Tool Co. has formed a new operating district, called the Four Corners district, in New Mexico, Colorado, Utah, and Arizona, according to I. J. McCullough, president. Included in the new district will be the previously established service branch at Farmington. N. M.

The Four Corners district, with headquarters at Farmington, is under the management of John W. Coulter, district manager. Prior to his transfer to the new district, Coulter was district manager of the West Texas district at McCullough's Odessa, Tex., office.

Assisting Coulter are Branch Manager R. L. Walker, who directs service operations at the Farmington branch, and B. L. Martin, branch manager of a new service location just opened at Cortez, N. M. Sales representatives in the Four Corners district are O. L. Van Landingham and Clarence O. Wilson.

J. W. COULTER

R. L. WALKER

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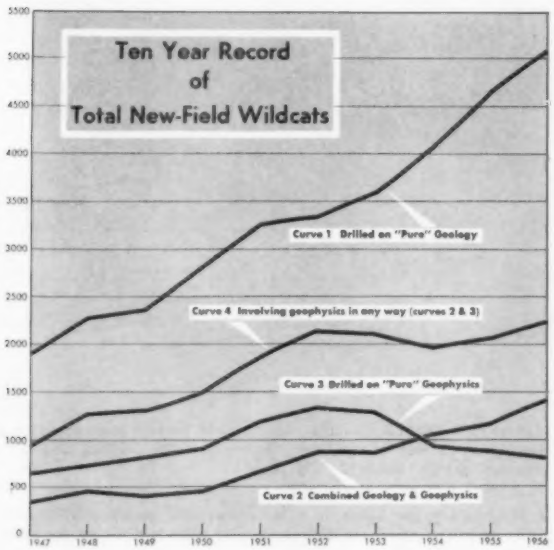
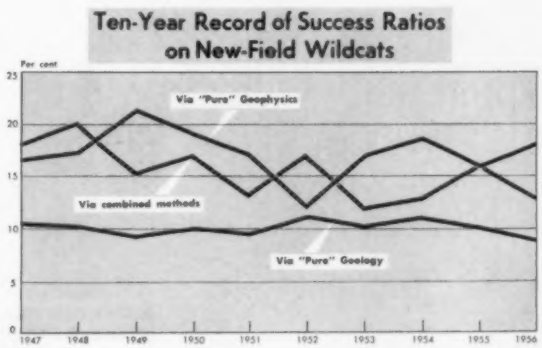




Wildcat Success Points Up a Need

By Frank J. Gardner

MIKE HALBOUTY, Houston geologist and petroleum consultant, recently made a speech. And when Mike talks, people listen, for he has demonstrated in the most practical way that it's still possible to find plenty of new oil on the Gulf Coast, one of the country's oldest producing provinces. The most practical way, of course, is by actually finding it. He has found it.

To the annual meeting of the American Institute of Mining and Metallurgical Engineers, Halbouty declared: "Management backed the geophysicists to the limit and in doing so forgot about the geologists for years, and it is gratifying to know that in the last 18 months management realizes its mistake and has seen to it that more cooperation between these two . . . is necessary, and with most successful results." He referred to the period of neglect as "the big forget."

Geology survived . . . But geology survived the big forget. So did geophysics. The two professions are becoming more closely knit every day, and it is entirely conceivable that at some future time they will coalesce completely. And that will be a happy day for oil finding.

Meanwhile, where do they stand in present-day exploration? This question was prompted by a casual remark overhead at a recent geological meeting: "It's certainly encouraging to see that more and more wells are drilled on surface and subsurface geology alone. Our outfit simply can't afford geophysics any more." The man who said this, in case you haven't guessed, was a geologist. He was unconsciously wishing a quick demise to his wrinkle-chasing cohort, but wistfully admitting in the same breath that a combination of the two would be ideal.

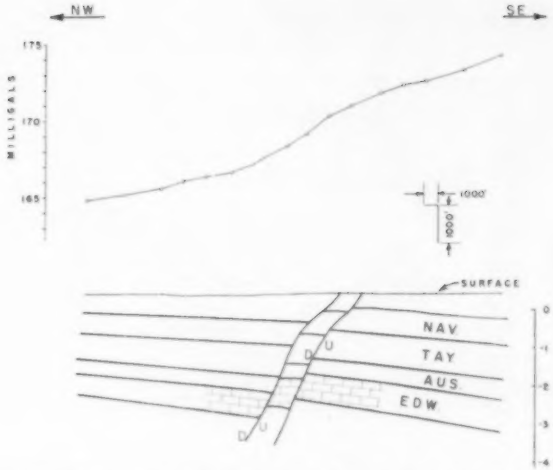
Now, remarks like that are always fodder for this column. **Were** more and more wells being drilled on geology alone? The answer could come from only one source—the annual reports of the American Association of Petroleum Geologists' Committee on Statistics of Exploratory Drilling. The curves on this page were constructed from the committee's figures for the past 10 years, and they did turn out to be revealing.

While geophysics hit the skids . . . Obviously, since 1952, new-field wildcats located on pure geology have spiralled upward, and those located on pure geophysics have been steadily on the skids. But over the same period, Curve 2 reflects a steady increase in the number of wildcat locations based on a combination of the two. This is the healthy sign in the picture, for a glance at the success ratio curve on new-field wildcats reveals that we've had consistently better luck when geophysics was put to use.

Over the 10-year period, geology has held a steady 10 per cent success ratio, and geophysics has averaged 17.3 per cent, while a combination of the two has resulted in a 15.4 per cent success record over the decade. In 1956, geophysics was more successful than either of the other two; perhaps this is a reflection of better tools and better interpretation by the wrinkle-chasers, but we'd like to believe that it's a result of the increasing emphasis on making geophysics intelligible to the geologist that's responsible. This may well be. If so, more credit to the geophysical profession, for they've gone farther and tried harder at mutual understanding than the rockhounds have.

But both are essential . . . The two must work together. As Halbouty pointed out in closing his speech, "The geologist and geophysicist working together could coordinate drillable prospects by the hundreds which would produce large quantities of petroleum on the land area."

Oil begets oil. And what this country needs is a good 5-year beget, not another big forget. **End.**



GRAVITY PROFILE across Luling field reveals high readings on the upthrown side of the fault. Notice how the faulting affects the regional gravity gradient. Fig. 2.

REGIONAL GRAVITY MAP along the Edwards trend shows two pronounced trends, one positive, the other negative. Gravity results are the cumulative effects of both the basement rocks and the sedimentary deposits. Fig. 1.

Part 1 of this symposium was published last week.

How Geophysics Provides Deep Edwards Data

Part 2

Geophysics is playing a vital role in finding new reserves in the Edwards limestone play in South Texas. Successful seismic work depends entirely on close coordination between the geologist and the geophysicist.

By W. Lee Moore

AFTER the confirmation of production in the Edwards formation at Luling in the early thirties, geophysics and geophysical methods have played an important integral part in the long-range program of developing the Edwards trend through South Texas. The recently revived interest in deeper Edwards production has stimulated the need for the assistance which geophysics can offer to the geologist and/or management in their decisions relative to exploratory programs. Geophysical methods also are being applied for more detailed information and further exploratory effort along the shallower portion of the Edwards trend.

Gravity work . . . Fig. 1 is a regional gravity map of a portion of the Edwards trend of South Texas. Gravity data show the cumulative effects of both the basement rocks and the sedimentary deposits. The maxima axis reveals that denser materials are nearer the surface along this axis in comparison to the minima axis that parallels it on the northwest. On a regional basis, the usual interpretation of the gravity data would result in a conclusion that basement rocks are closer to the surface along the maxima and deeper along the minima. This maxima, incidentally, extends north and northeast along the Luling - Mexia-Talco fault trend.

A gravity profile across Luling field is representative of the effect of shallow density changes on the regional gravity picture (Fig. 2). The higher gravity readings are observed on the upthrown side of the fault system where the denser rocks are closer to the surface. The regional gravity gradient is represented by the lines through gravity readings on each side of the fault. The offset in the alignment of the lines is a measure of the anomalous condition disclosed by gravity readings.

Seismic results . . . An index map (Fig. 3) shows the position of the gravity profile across Luling field, and location of five representative reflection seismograph records presented in Figs. 4-9. An outstanding reflection believed to be from the top of the Georgetown-Edwards series will, for the sake of brevity, be called the Edwards from here on out.

Fig. 4 shows the strong Edwards reflection in southern Bexar County. Depth is about 3,300 ft. to Edwards. The central Atascosa County record (Fig. 5) also picks up several strong reflections. Here we see the strong

Edwards event about 8,000 ft. in depth and also a deep reflection and unidentified but marked Jurassic. We may aim some day at this level for our new reserves.

A record in central Wilson County (Fig. 6) again maps the strong Edwards event (at 6,100 ft.). There is a marked similarity in the character of the reflections and the time intervals on several reflections between this record and the one for central Atascosa just shown.

A closeup (Fig. 7) of the deeper events on a record in southern Atascosa County along the deep Edwards trend reveals the strong Edwards event again (at 11,500 ft.). In most areas the Edwards is typically a strong reflection and in geophysical lingo a doubleton—that is, there will be two strong cycles shaped like the letter W. A deep reflection is unidentified but indicated as possibly Jurassic (?). The time on this event is 3.300 seconds and the estimated depth is 18,000 ft.

In southern McMullen County, the outstanding reflections (Fig. 8) are in the Wilcox zone, but a deep pair of reflections are identified, one of which is believed to be Edwards. Possibly a ? mark should have been placed on the Edwards pick since no well has penetrated this formation for positive identification in this area. An estimated depth to the reflection picked as Edwards would be about 15,500 ft.

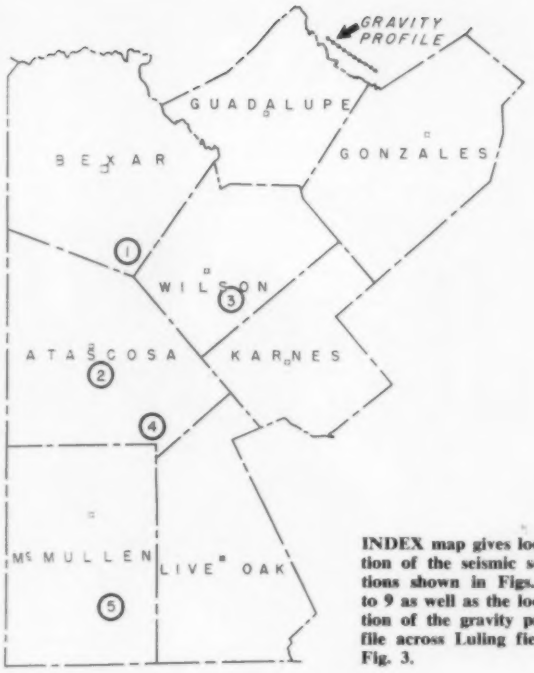
Fig. 9 shows the correlation of four seismic events across three records: B, C, and D, along the Edwards trend where an up-to-the-coast major fault, cutting as high as the Navarro and with about 200 ft. of throw on the Edwards, is mapped; there is also a smaller questionable fault cutting no higher than the Edwards—also up-to-the-coast and with a very small throw.

This smaller fault may result from distortion or erratics due to unusual ray paths from the shot through the major fault plane to reflectors below the major fault. This type of distortion is described by Miller Quarles, Jr., in his published paper in Geophysics entitled, "Fault Interpretation in Southwest Texas."

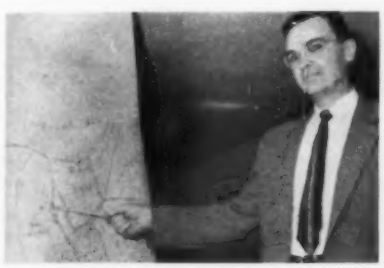
A cross-section (Fig. 10) has the same seismic data plotted in section on a 1:1 scale.

Geophysical costs for surveys along the Edwards trend are about average. Much of the seismic exploration in today's programs is conducted along bulldozed lines in an effort to run the seismic lines at right angles to strike and at right angles to the trend of faulting. This policy, although partly in contrast to that followed in earlier work when roads were generally used, aids the seismologist in his interpretation.

Public relations is an important phase of the geophysical operations. Before any area is entered for a geophysical survey the preliminary groundwork should be laid by a representative who can obtain the permit for the survey from the landowners and lessees, discuss the method of entry for the



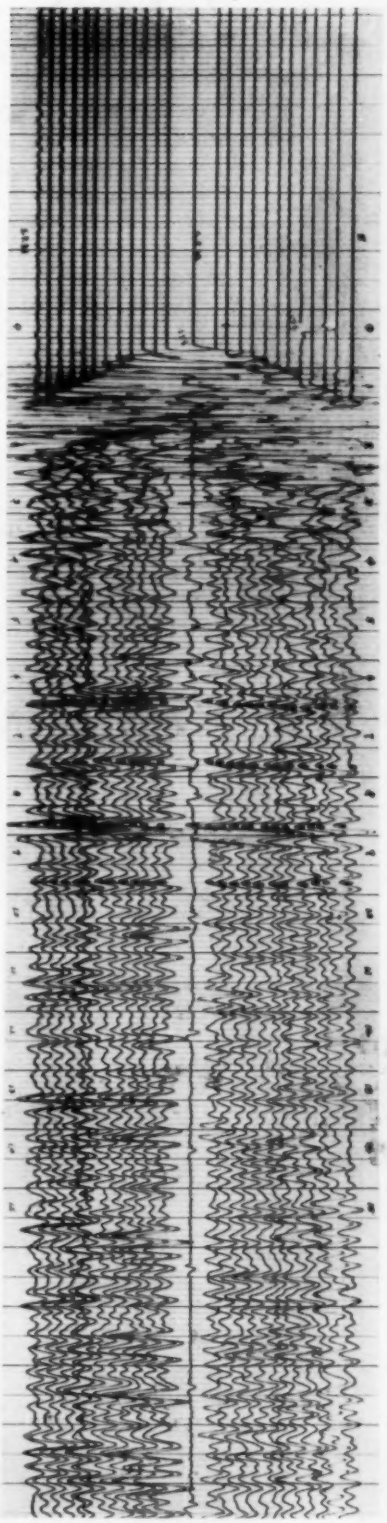
INDEX map gives location of the seismic sections shown in Figs. 4 to 9 as well as the location of the gravity profile across Luling field. Fig. 3.



THE AUTHOR

W. Lee Moore is vice president, Petty Geophysical Engineering Co. He is an electrical engineering graduate of the University of Texas, and has been continuously employed by Petty since 1930. He has been in charge of seismic operations in all parts of the United States, in Cuba, and in Egypt.

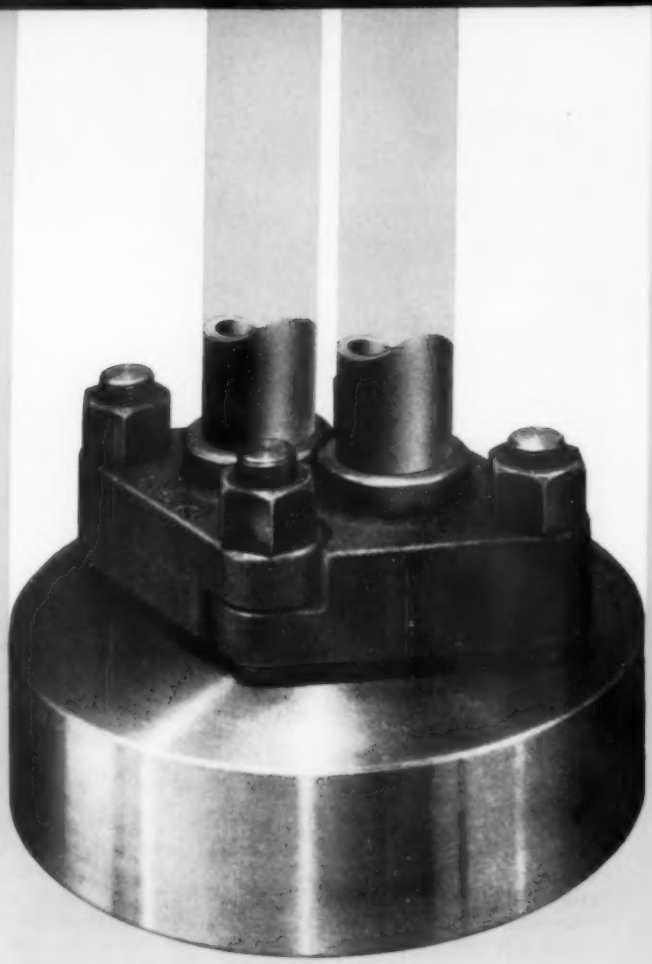
Location 1
on the Index Map



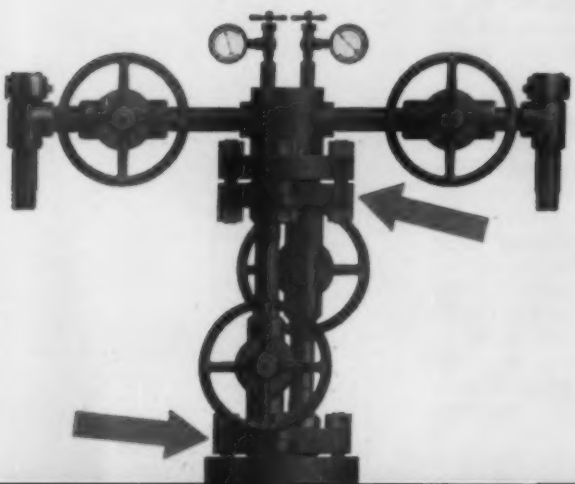
THIS SECTION is from southern Bexar County where the Edwards is about 3,000 ft. deep. Fig. 4.

it's new!

THE O·C·T DELTA FLANGE



BEST THING THAT EVER HAPPENED TO A DUAL STRING TREE



Developed and proved by O-C-T, Delta Flanges are the latest improvement in dual string tree construction.

O-C-T Delta Flanges are unusually strong because each flange half is supported—in perfect balance—by three equally spaced studs and nuts. This balance, plus compact design, accounts for unusual strength and freedom from leakage. Laurent Seal Rings are utilized to keep the pressure area at a minimum.

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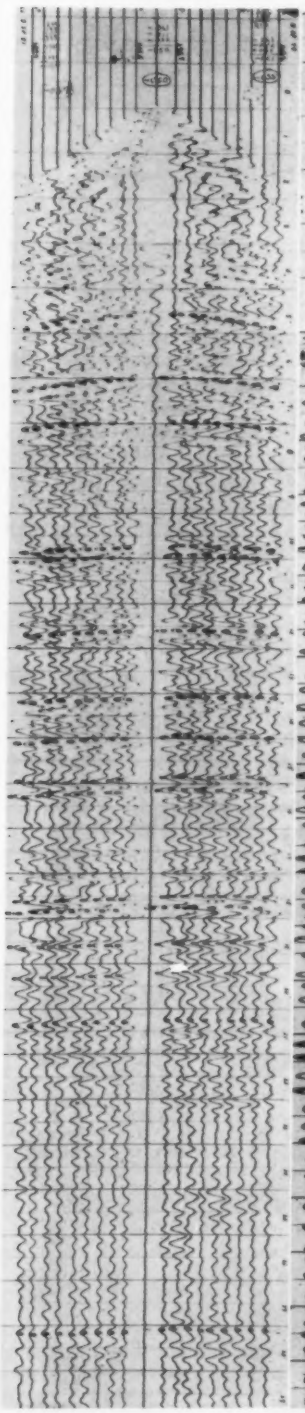
DELTA FLANGES ARE JUST ONE MORE REASON WHY O-C-T DUAL STRING TREES HAVE SET THE INDUSTRY STANDARD

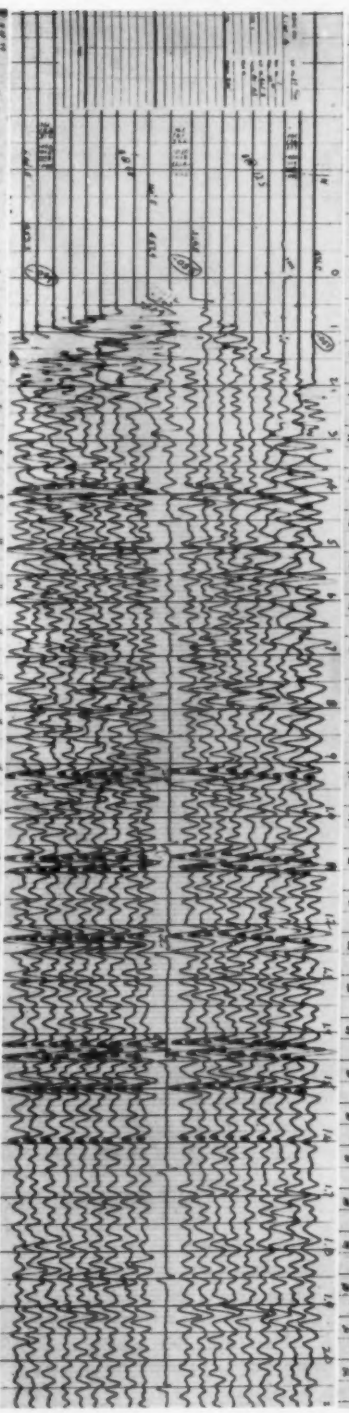
Photostat Prints of Seismic Reflection Records

Location 2 on the Index Map



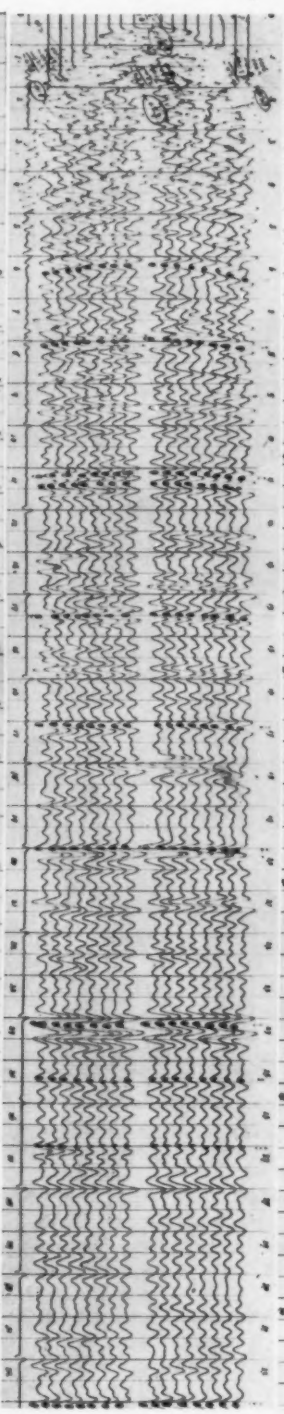
CENTRAL Atascosa County group of records maps the Edwards at 8,000 ft. and also a deeper reflection tentatively identified as Jurassic. Fig. 5.

Location 3 on the Index Map



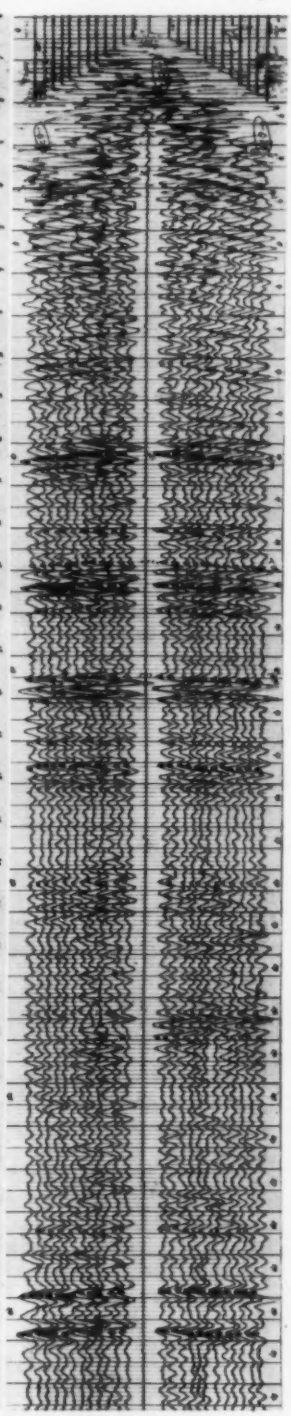
COMPARE this set of records from central Wilson County with Fig. 5 and notice the similarity. Edwards comes in at 6,100 ft. Fig. 6.

Location 4 on the Index Map



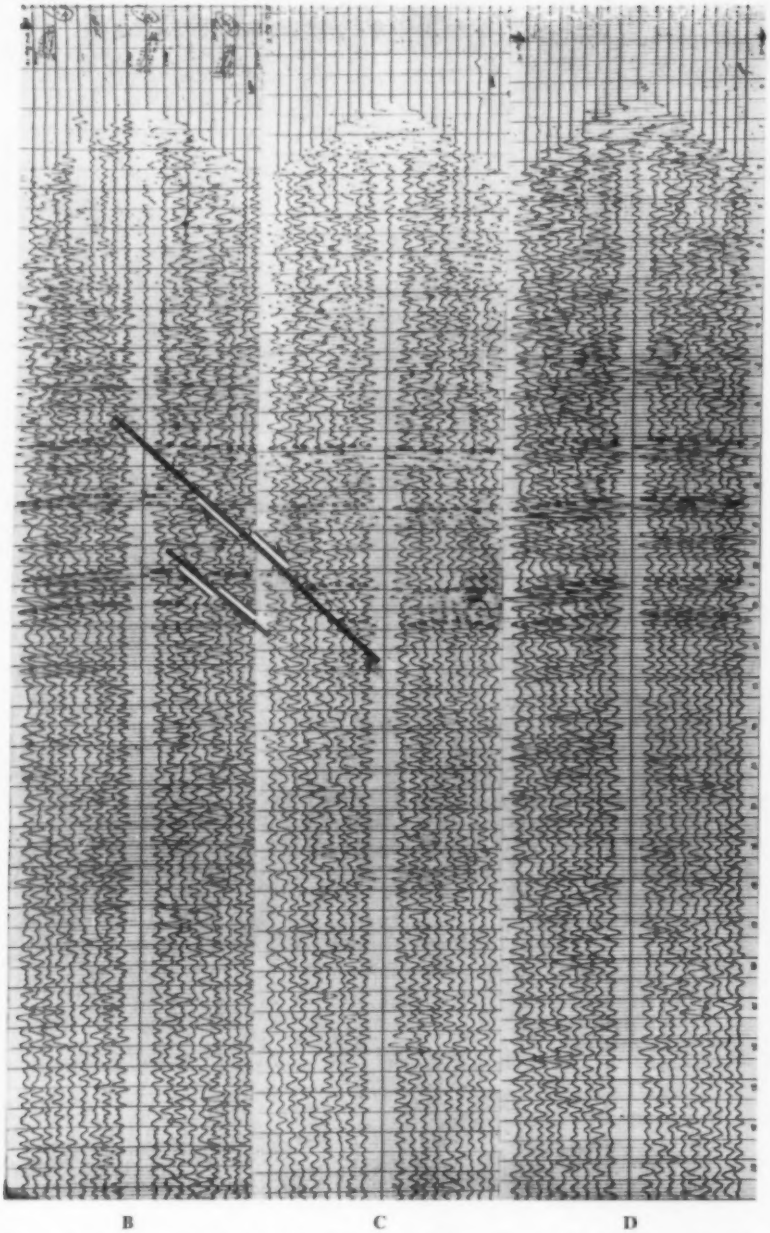
TYPICALLY the Edwards is a strong reflection and usually easily identified. Section is in southern Atascosa County. Fig. 7.

Location 5 on the Index Map

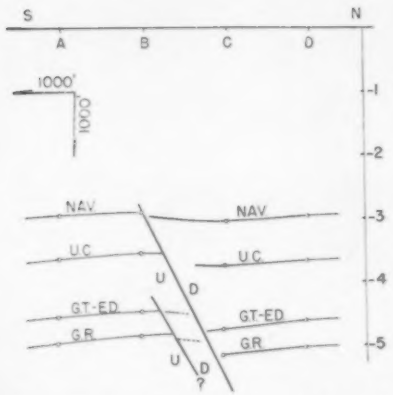


IN southern McMullen County, outstanding reflections are from the Wilcox although the Edwards is tentatively identified at 15,500 ft. Fig. 8.

Up-to-the-coast fault . . .



HERE an up-to-the-coast fault is shown that affects Navarro beds. Throw on the fault at Edwards level is 200 ft. Fig. 9.



SEISMIC DATA from the records of Fig. 9 are plotted on a geologic cross-section. Fig. 10.

trucks, and explain the proposed plans for shotpoint locations, bulldozing, and the like. The costs of bulldozing and permitting, incidentally, add to the over-all costs.

In many areas two shot-hole drills are needed for a maximum efficiency. Multiple detectors are accepted as an aid in obtaining optimum quality records for the seismologist whose responsibility it is to make the interpretation.

Magnetic recording is now the popular method to present data. Many major oil companies have converted their own crews and have asked their contract seismic crews to convert to tape recording. Seismic energy is recorded on tape and then played back through filtered channels. Weathering and elevation corrections and corrections for normal stepout or moveout of reflection times are all removed. The final result is a cross-section or record section on which all of the seismic data for a number of consecutive shotpoints along a profile line are presented totally corrected for all variables. Record sections have generally been accepted by geologist and geophysicist alike as probably the best way to present seismic data for evaluation.

The effectiveness of an exploratory program along the Edwards trend, or in any area, is dependent upon the close cooperation and the mutual understanding of the problems, between both the geologist and geophysicist. Teamwork is essential and teamwork will pay off.

Acknowledgment

Lone Star Producing Co. made the seismic records available to the author, and this courtesy is appreciated.

BOOKS

ENGINEERING THERMODYNAMICS by C. Osborn Mackey, William N. Barnard, and Frank O. Ellenwood. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, New York. 428 pp. $7.95.

This book deals with the fundamentals of heat and power engineering. Principles are laid down in the early chapters which include the properties and processes of real gases as well as the general thermodynamic equations.

Subsequent chapters, stressing applications, show the influence of recent developments in their treatment of one-dimensional flow of ideal gases with area change, friction and heat transfer; properties of mixtures of ideal gases; ideal-gas reactions; energy transformations in turbines; power cycles with real fluids; and other topics.

The increased importance of turbomachinery is brought out. Centrifugal compressors and axial-flow compressors are included along with the conventional study of cycles of reciprocating compressors.

Considerable attention is given to power cycles of vapors including the reheating cycles, regenerative cycles, reheating-regenerative cycles, and the two-fluid cycles, that have been proposed for use in nuclear plants.

Over 300 problems appear with answers and all are designed to illustrate the application of the important principles.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Oil Well Extends Spring Mountain Area

A ½-mile step-out in an area north of Spring Mountain, Monroe Township, Coshocton County, resulted in 30 bbl. producer with 325,000 cu. ft. gas. Natol Corp. 1 Emmet Snow, Section 8, logged Clinton at 3,312-34 ft. with only a small showing natural.

● The latest completion in northeast Howard Township, Knox County, indicates a small, but rich pool. Preston Oil Co. 1 R. J. Hawk (Durbin), Lot 10, made a good showing natural in Clinton at 2,633-85 ft. and gaged, after fracture, 355 bbl. in 24 hours.

● A ¼-mile east extension to the new pool in Hopewell Township, Perry County, gaged 100 bbl. in 24 hours after test. Natol 1 King Brothers, Section 1, logged Clinton at 2,976-3,030 ft. with a fair showing natural.

WEST VIRGINIA

Fracture Results in Tucker County Success

In Licking district, Tucker County, Hope Natural Gas Co. 10072 W. Asa Street, was completed successfully after fracture in the chert. The final gage was 778 M.c.f. of gas per day with rock pressure of 1,930 psi. in 72 hours.

The chert was found at 4,408-4,598 ft., gas at 4,478 ft. Total depth was 4,835 ft.

EASTERN KENTUCKY

Deep Leslie Wildcat in Knox

Eastern Kentucky's only current pre-Silurian deep test is drilling slowly ahead at 5,938 ft. At this depth well is nearly 1,000 ft. in the Cambro-Ordovician Knox dolomite topped at 4,964 ft. Well is that of United Fuel Gas Co. 28 Fordson Coal Co., located on Left Fork of Elkhorn Creek in Leslie County. No significant showings have been reported.

● In Lawrence County and on the waters of Bevins, Meade, Hickman and Levisa, shallow wells are being completed in an area where gas was discovered early in the year. Producing formation is the Berea (Mississippian) sand at an average depth of 1,300 ft. Wells average 100,000 cu. ft. of gas daily with a rock pressure of 450 psi. Operators in the field include: Jack Manning, Allen & Miller, Kentucky West Virginia Gas Co. and others.

ARKANSAS

Deeper Sand Produces In Old Kibler Gas Area

A deeper gas-productive sand has been uncovered in the old Kibler gas area, 10 miles northeast of Fort Smith,

Exploration This Week

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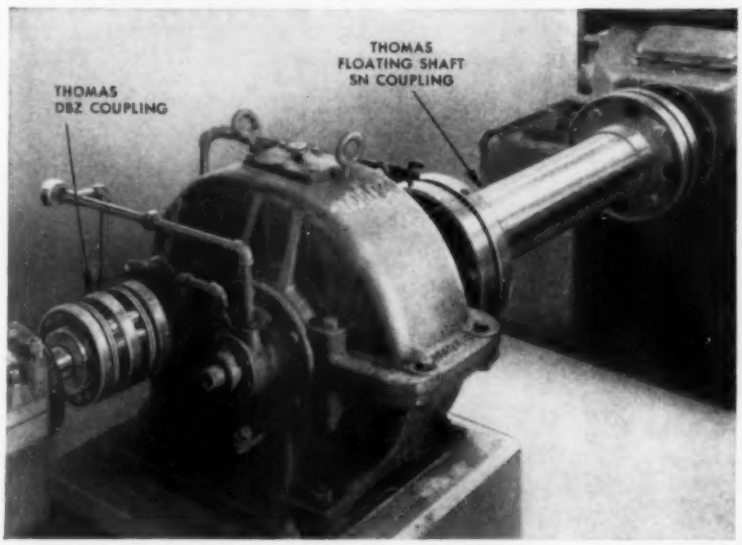

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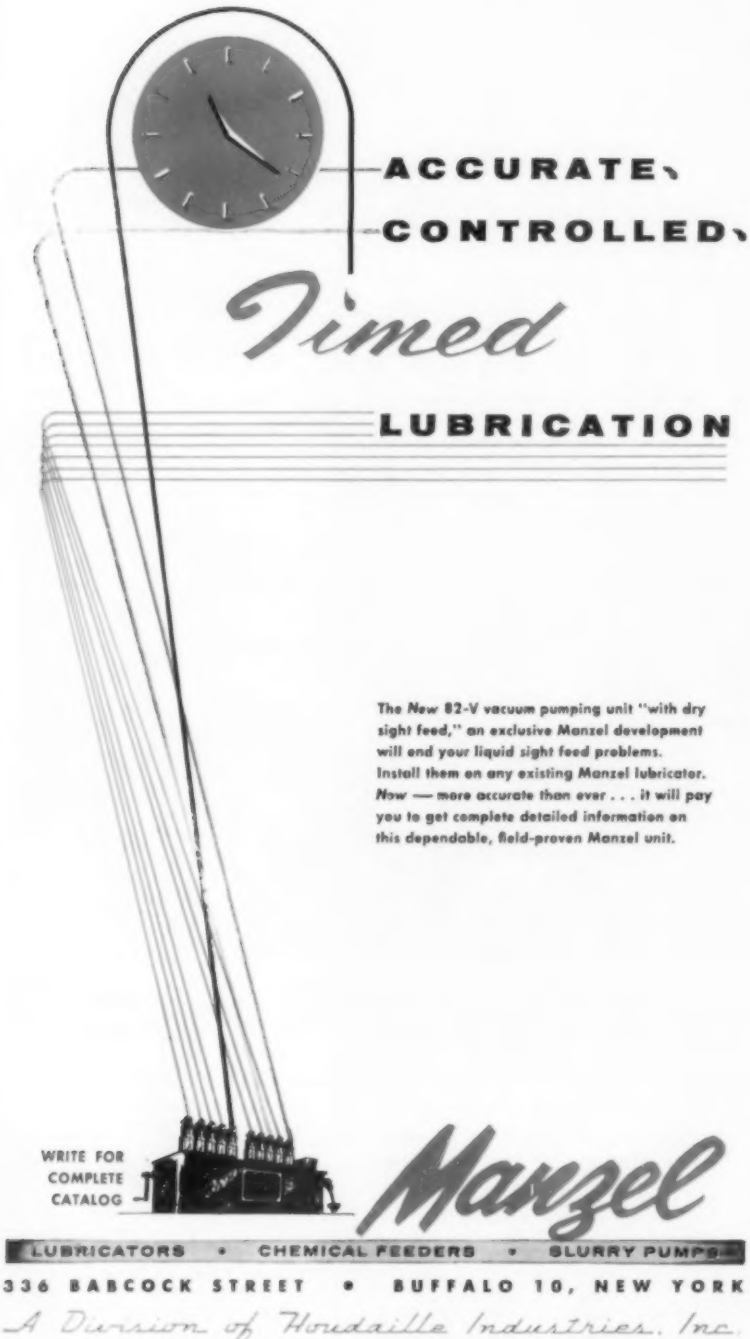
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The new pay is in a basal Atoka sand, topped at 4,857 ft., with elevation of 456 ft. Previous production in the area has been from Atoka at 2,285 ft. and 1,260 ft. Deepest previous test was drilled to 2,775 ft. First production was in 1915.

The new discovery well is a joint operation of Stephens Production Co., of Fort Smith, and Gulf Oil Corp. at 1 Maggie Turner, in 33-9n-30w. It is being drilled ahead to an objective depth of 5,400 ft. to see the Hale sand. It is drilling with air, carrying an estimated flow of 4,500,000 cu. ft. of gas per day.

CALIFORNIA

Two New Tests for San Mateo County

Plans for two wildcats near the La Honda field, 10 miles south of San Francisco in San Mateo County, have been announced by Union Oil Co. One test, 1 J. Breeden, will be 2½ miles northeast in 4-7s-4w. The other will be 1 F. P. Guerra, in Section 15 and 1¾ miles northeast.

Neaves Petroleum Co. most recent completion at La Honda was one of the best completed in the shallow Eocene pool opened last October. From a reported 60 ft. of sand at 1,590 ft., 7 La Honda on a 5-hour gage flowed at a 430 bbl. daily rate through an 18/64-in. choke.

About ½-mile east of the discovery well, which is located in NW SE 17-7s-4w, United Cuban Oil Co. was attempting to complete 1 Muller at a greater depth. An ungaged amount of oil was produced after the interval 2,515-25 ft. was perforated but the operator held up completion to take in an additional 30 ft.

South Joaquin Valley Oil Search Expands

A new play for Stevens sand production in the San Emido foothills on the extreme south end of San Joaquin Valley is gathering momentum. Shell Oil Co. and Amerada Oil Corp. have entered the search in the area west of Wheeler Ridge where Richfield Oil Corp. drilled several deep tests after discovering Eocene production at Wheeler Ridge in 1952.

The latter has staked location for a 14,000-ft. test on an 8,500-acre block recently acquired from Kern County Land Co. It will be 33-15 K.C.L. in 15-11n-21w, 4½ miles west of Wheeler Ridge and about 3 miles northwest of Pleito Creek production.

Shell, which reportedly took on a new block of about 20,000 acres from the land company, has one test under way and has staked location for a second. Its 48-25 K.C.L. in Section 25, 1 mile northeast of Pleito Creek, was preparing to test a show after setting 7-in. pipe at 11,719 ft. The second test, 16X K.C.L., will be in 26-11n-22w, nearer the Los Lobos field.

Amerada was nearing the 11,000-ft. mark at a wildcat about 1 mile north of the projected Shell test. Labeled 1-23 K.C.L., the Amerada test is on a 5,000-acre block in 23-11n-22w.

New West Montalvo Pool

Richfield Oil Corp. opened a new oil pool on the southeast edge of the West Montalvo field in Ventura County. The well flowed 164 bbl. of 15°-gravity crude for the interval 10,577-10,606 ft. The redrilled hole was bottomed at 10,610 ft. after first having been carried to 14,560 ft.

The pool-opener, 3 Laubacher-Fleisher, is in 31-2n-22w. It is about ½-mile southeast of a 14,000 ft. extensioner Sunray Mid-Continent Oil Co. completed last year in the Colonia pool.

CANADA

ALBERTA

Phillips Kaybob Well Is Beaverhill Lake Well

Another of the three highly significant Middle Devonian oil discoveries in northern Alberta has indicated good flow rates during initial production tests. This new success was drilled by Phillips Petroleum Co. in the Kaybob area of the province, 140 miles north-northwest of Edmonton and 90 miles southeast of Grande Prairie, on acreage acquired under a farmout agreement from the team of British American Oil Co., Ltd., and the California Standard Co. The well, Phillips 1 Kabob, indicated discovery earlier in the year when flow rates as high as 110 bbl. per hour were recovered during drill-stem test evaluations in the Beaverhill Lake-Middle Devonian horizon. Previous information carried indicated that the discovery horizon was the Slave Point sector, however, that has since been defined and the Slave Point in reality is only the porous section of the Beaverhill Lake. The latest series of production tests recently concluded, through various sized chokes, gave up 1,260 bbl. of clean crude during a 31-hour period. The well is now shut in waiting on further production tests.

Kaybob No. 1 was drilled on LSD 7, 22-64-19w5. It is 35 miles west and 6 miles south of the Home-Union-H.B. 9-20 Virginia Hills Middle Devonian discovery hole which was reported last week as having established flow rates as high as 1,200 bbl. per day. The other Middle Devonian discovery in this area, Home et al Regent 8-11 Swan Hills, lies 25 miles northeast of the Virginia Hills venture which places it approximately 58 miles northeast of Phillips success.

Two separate sets of perforations totalling 39 ft. were opened up for production tests. The upper set is 25 ft. in length below 9,639 ft. and the lower interval measures 14 ft. below 9,687 ft. Flow rates obtained through chokes

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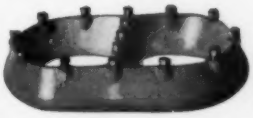

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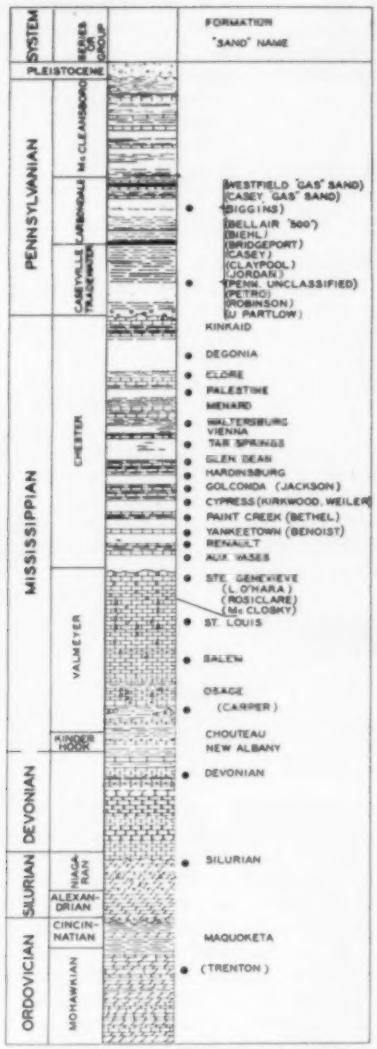
varying in size between 48/64-in. and 1/64-in. were established in 1-hour tests at 70 bbl. on the larger sized opening and 23 bbl. on the smaller.

Another well has been started by Phillips in this area and the British American-Cal-Standard team is just getting under way at an additional hole. The Phillips test lies 4½ miles southeast of the initial discovery while the British American-Cal-Standard venture is 4 miles south and 1 mile west.

• The Virginia Hills area of northern Alberta was warmed up even further recently with the announcement that the Hudson's Bay Oil & Gas Co., Ltd., had flowed gas at a high rate and recovered some oil during a drill-stem test in the Gilwood sector of the Cambrian horizon at its 1 East Virginia Hills test, 24 miles southeast of the Home et al 8-11 Swan Hills Middle Devonian oil discovery hole. The watched for Middle Devonian sector prevalent and oil productive in the area proved nonproductive at this hole but company officials have placed a great deal of faith on the Gilwood sector as production casing has been set and an attempt will be made to place the well on production from it.

During the drill-stem test at the venture, which was drilled on LSD 5, 31-65-6w5, a gas flow rate of 3,800,000 cu. ft. daily was tested and a pipe recovery of 315 ft. of light gravity oil was recovered from the 40-ft. interval tested below 7,087 ft.

ILLINOIS BASIN



This correiator published by courtesy of the Illinois State Geological Survey.

LOUISIANA

NORTH LOUISIANA

First Cotton Valley Well Indicated at Sugar Creek

A deep test being drilled by A. J. Hodges Industries, Inc., and Union Producing Co. in the old Sugar Creek field, in southeastern Claiborne Parish, is giving indications of gas production in the Cotton Valley section.

If it makes a well it will be the first Cotton Valley production in that field. Present production is from the Ro-

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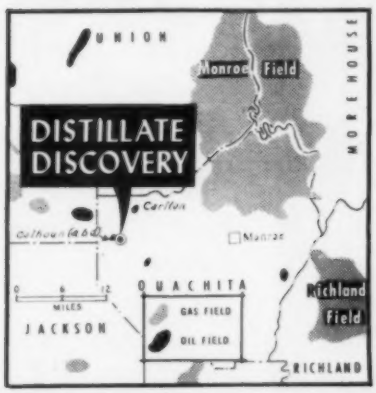
dessa, Sligo, and Hosston horizons. The field was discovered in 1930.

The Hodges-Union well, 1-A Simms Unit, in 29-20n-5w, on the north flank of the field, recovered 100 ft. of dark distillate and 540 ft. of distillate-cut water cushion and mud in a drill-stem test of the Cotton Valley-Bodcaw sand.

Tested interval was at 8,697-33 ft. Tester was open 25 minutes through 5/8-in. bottom and 1/4-in. top chokes, and used 2,700 ft. of water cushion. There was a gas blow during the test, which unloaded water cushion with maximum top pressure of 1,100 psi. Bottom-hole pressures were 2,470 psi., flowing, and 4,085 psi. shut in.



MAP SHOWS location of Arkansas Louisiana Gas Co.'s newly completed rich gas-condensate discovery well in Calhoun area, 15 miles west of Monroe, in western Ouachita Parish, North Louisiana (see The Oil and Gas Journal, August 5, 1957, page 57). The well, 1 Pipes, flowed 1,879 bbl. of 53.8°-gravity condensate with 7,100,000 cu. ft. of gas per day from perforations at 9,121-24 ft. One other Cotton Valley well, completed in 1948 and now abandoned, produced from a 9,500-ft. pay.

OFFSHORE LOUISIANA

Fourth Sand Opened in Eugene Island 160 Field

Four wells completed, each in a separate deep sand, is California Co.'s score so far in the development of its East Cameron Block 160 field, nearly 50 miles off Cameron Parish, in the Gulf of Mexico.

Latest well, completed last week, opens the deepest reservoir so far. From Miocene sand perforated at 11,428-74 ft., it flowed at the daily rate of 160 bbl. of 52.5°-gravity condensate per day with 2,400,000 cu. ft. of gas. Flow was through 11/64-in. choke under pressure of 4,750 psi.

This well is the company's 42-A OCS-0541. Discovery well, 1-A, was completed last September as a gas well at 8,700-8,864 ft. The second well, completed last January, was oil productive at 11,330-38 ft. The third well, completed last March, produced gas and condensate at 9,694-9,500 ft.

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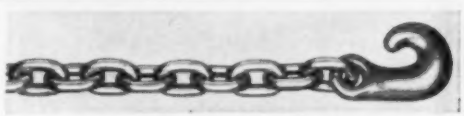

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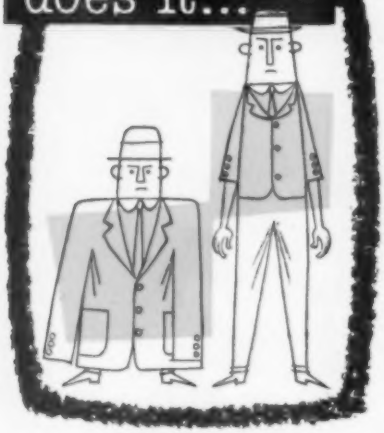

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New Offshore Discovery Is Fifteenth This Year

The fifteenth new field to be found this year in the Gulf of Mexico off Louisiana's coast was opened last week by Union Producing Co.

Union's discovery well, 1-A OCS-0479, is in Block 53, Eugene Island area. It is nearly 20 miles from shore, off St. Mary Parish.

Daily flow rate of 440 bbl. of 33.7°-gravity oil through ⅛-in. choke was gaged for state potential. Flow was with 340,000 cu. ft. of gas and pressure of 3,500 psi.

Union's second test is being drilled from the same platform.

MICHIGAN

Lincoln Wildcat May Produce in Squaw Bay

An earlier Lincoln Township, Arenac County wildcat that showed some free oil in Squaw Bay Traverse lime, but which was drilled out dry in Dundee, was reopened and tested in the Squaw Bay with free oil recovered in amounts that make it worthy of further consideration.

Carlson & Sole, after old well was transferred from Louis J. Meyer and Chris Barnhardt, cleaned out and set 5-in. casing at 1,986 ft. at the 1 Nigl, SW SE NE 18-18n-4e. Top of Traverse lime was picked at 1,993 ft. Hole was cleaned out to 2,070 ft., plugged back to 2,015 ft. and then redrilled to 2,018 ft. present total depth. Pay was logged at 1,992-2,002 ft. On a 3-day swab-flow test, swabbing 14 hours daily, well has produced an average of 10 bbl. of oil per day. Well will be stage treated first with 500 and then with 1,000 gal. of acid.

• Two new Dundee wells, one on the south flank and the other on the west flank of the developed Birch Run Dundee oil pool, were completed good for 50 bbl. of oil a day each, restricted flow, to enhance further prospects of commercial development in the field. Both wells were sand fractured through 5-in. casing, were rated good for in excess of 100 bbl. a day, and were rated as good as, or better than, any well drilled in the pool to date.

At a south extension location to the field—a hole originally completed dry in Dundee in 1951—Graham Wilcox developed production estimated as high as 14 to 15 bbl. an hour after frac. This well, the 1 Mulheman, NE NE NW 29-10n-6e, Birch Run Township, Saginaw County, was fractured with 30,000 lb. of sand and 15,000 gal. of oil at 2,590 ft., total depth. Well flowed

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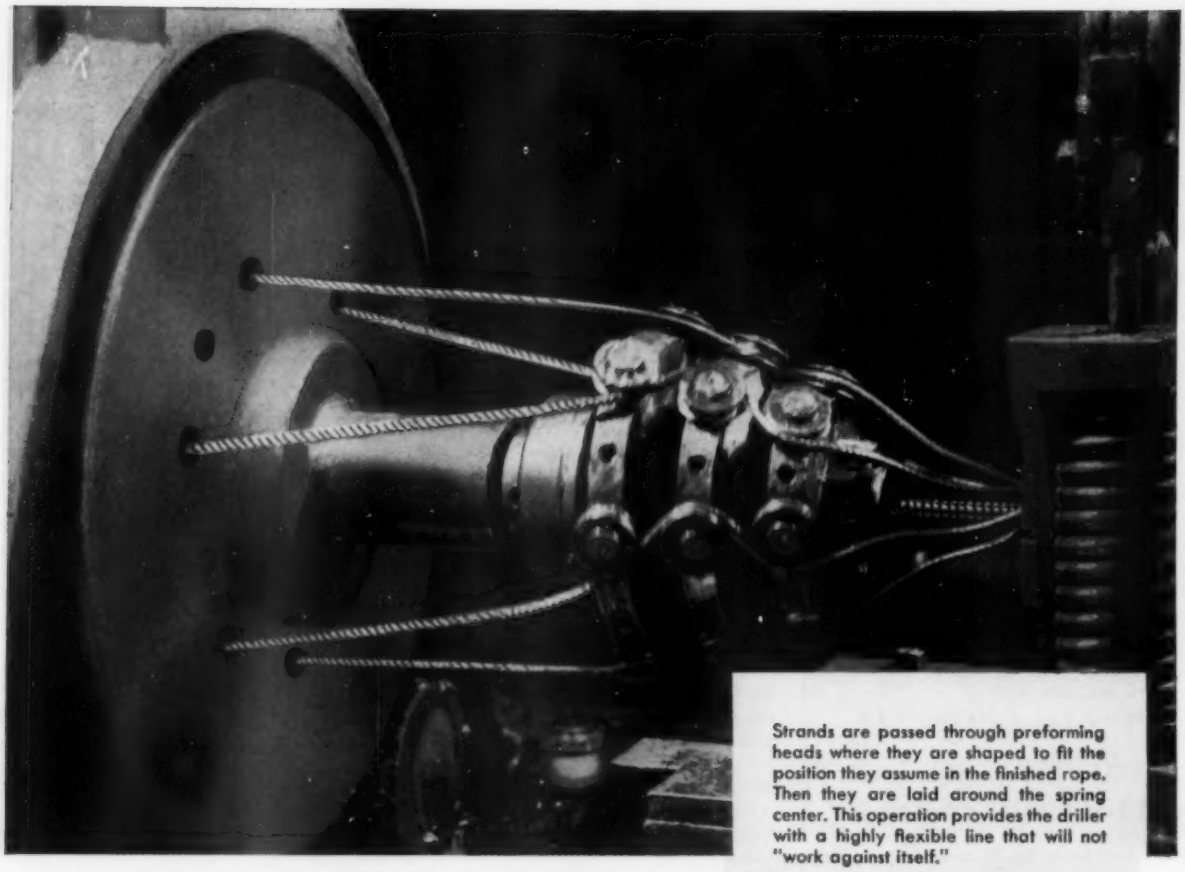

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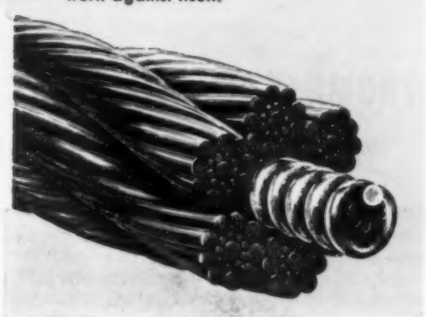

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MISSOURI

Here Is the 1956 Drilling Resume

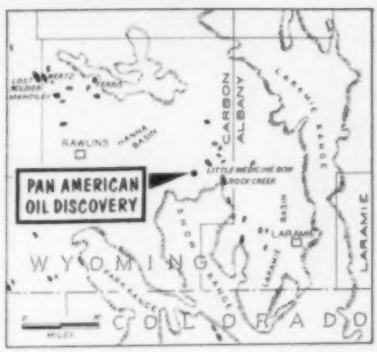
The resume of drilling activity in the State of Missouri was recently released. The report is published by permission of Dr. Thomas R. Beveridge, state geologist, at Rolla.

In 1956 a pipeline was laid from Turney gas field into Plattsburg and three more gas wells were completed in this field. Aside from this there were no unusual developments in Missouri last year.

With one small pool estimated, the total oil production was 65,212 bbl. with a value at the well of $176,723.14. There were 103 active wells.

Gas production was 7,000 M.c.f. from three wells, with a value of $1,750. There were 12 well completions in the state (1 oil, 3 gas, and 8 dry. Total footage was 13,990 ft. of which 4,354 ft. was drilled with cable tools and 9,636 ft. with rotary tools.

ROCKY MOUNTAINS



Pan American Petroleum Corp. 1 UPRR-Anschutz Ranch, important Jurassic oil discovery in Carbon County, lost circulation at 6,602 ft. Previous tests at this well flowed oil up to 175 bbl. hourly from the Sundance.

MONTANA

Sheridan County Test Recovers Devonian Oil

The Texas Co. and Mobil Producing Co.'s highly important Sheridan County wildcat, the 1 Brekke in C NW NE 5-33n-56e, 23 miles southeast of Outlook field, recovered gas and mud-cut oil on drill-stem test of the Nisku-Devonian.

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The test in the Devonian was taken at 8,838-8,905 ft. Recovery was 60 ft. of gas-cut mud, 180 ft. of gas and oil-cut mud, 180 ft. of gas and mud-cut oil, 90 ft. of gas and oil-cut salt water, and 1,765 ft. of gas-cut water.

This Winnipeg test to 10,800 ft. is drilling at 9,006 ft. Location is 10 miles southeast of Plentywood, Mont. Success would open another vast northeastern Montana Williston basin area to production.

TEXAS

NORTH TEXAS

Reference Book for North Texas Counties

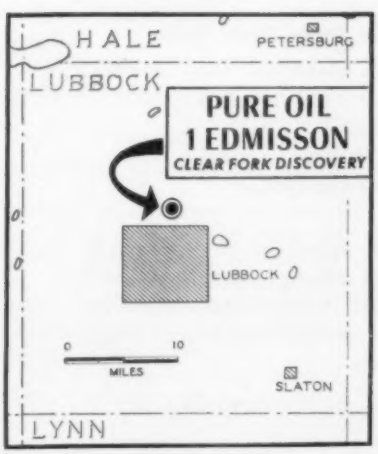
Rinehart Oil News, Dallas, announces distribution of a new reference book covering Archer, Baylor, and Clay counties.

The 250-page volume, covering the development history of approximately 300 fields in the three-county summary, is the first in a seres of five North Texas area reference books to be published during 1957.

The data in this reference book includes historical and statistical records of both old and new fields. It also has structural maps, land plats, generalized geological sectors, contour maps, and an east-west cross-section from Knox to Montague county.

When completed, the set will include maps, electrical logs, completion histories, and production statistics on some 1,500 individual oil and gas fields located in Texas Railroad Commission District 9.

WEST TEXAS



Pure Oil Co. 1 A. M. H. Edmisson, central Lubbock County Clear Fork discovery. Completion was on the pump for 43 bbl. of oil a day, plus 134 bbl. of salt water, from pay at 5,143-5,219 ft. This was an Ellenburger project, drilled to 11,202 ft.

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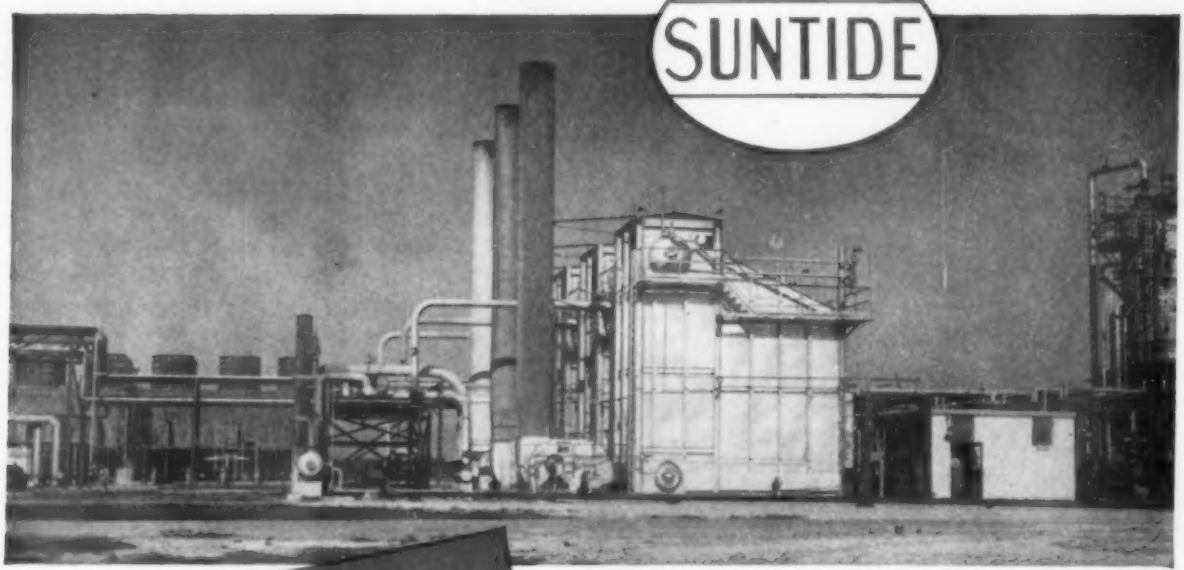

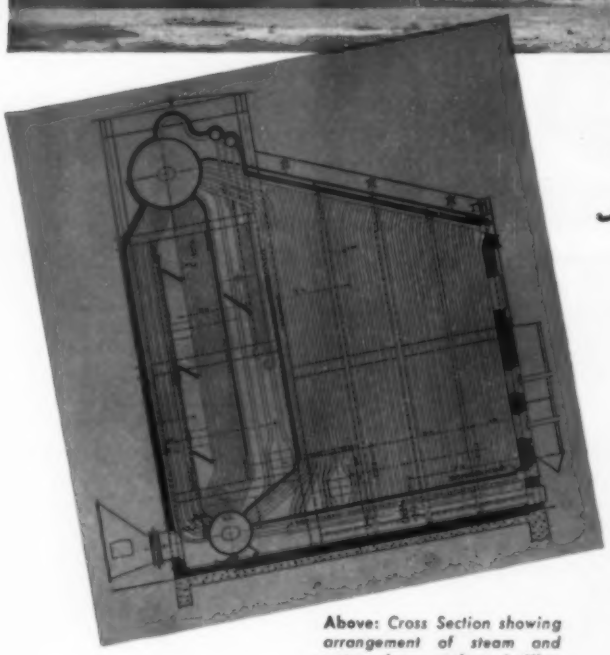

Above: *Cross Section showing arrangement of steam and water drums, tubes, baffles, and furnace.*

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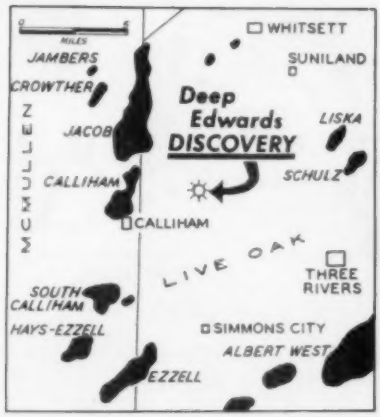


LOCATION of Live Oak County's newly completed Edwards discovery-well. It is the county's first Edwards production.

SOUTHWEST TEXAS

First Edwards Production Opens in Live Oak County

Potential tests at Standard Oil Co. of Texas' newly completed Edwards discovery-well in northwestern Live Oak County rate the well good for 1,350,000 cu. ft. of dry gas per day, open flow.

The well, 1 Isaacks, 2 miles northeast of Calliham (in McMullen County), is Live Oak County's first Edwards production. It is more than 15 miles from nearest other Edwards production. This is at Standard's new Edwards discovery-well in the Green Franklin area, westward in McMullen County.

It is a coastward extension of the deep Edwards play following a southwesterly-northeasterly trend through LaSalle, McMullen, and Atascosa counties, into Karnes and Live Oak counties, on the northeastern end.

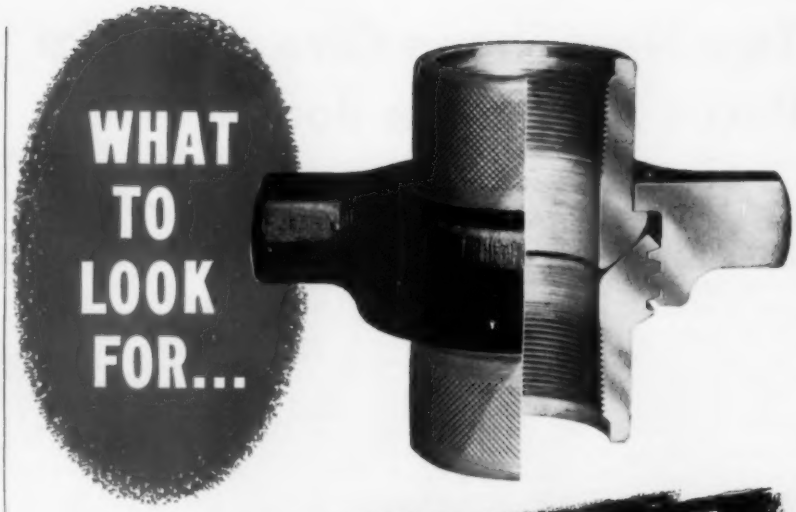
Standard's new well is productive from 6 perforated intervals from 12,456 to 12,736 ft. in hole drilled to 13,800 ft. The well now is shut in with pressure of 2,965 psi.

Elaine Discovery Opens New San Miguel Segment

Another fault segment is proving productive in Elaine field, in northwestern Dimmit County. The segment is in San Miguel sand, and has been discovered by Pronto Drilling Co. at its 1 Morris. Location is 10 miles northeast of Carrizo Springs.

The new reservoir is perforated at 4,431-37 ft. and tested 162 bbl. of 31°-gravity oil per day, flowing through $\frac{7}{16}$-in. choke. Gas-oil ratio is 900 cu. ft. per barrel, and flowing pressure 210 psi. Total depth is 4,454 ft.

Adjacent production in both the Elaine and North Elaine areas, is from several San Miguel and Olmos zones.



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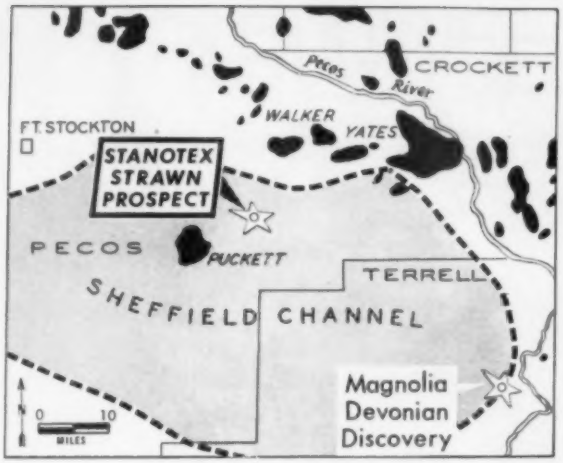
Two New Shows Give Pecos Area Extra Boost

by Carl Hoot
District Editor



TWO discovery prospects are shown in Sheffield Channel area of southern West Texas. Standard Oil Co. of Texas 2 Hokit, northeast of Puckett, recovered oil and gas from two sections of the Pennsylvanian. Magnolia Petroleum 1 Bassett is the Terrell County prospect.

SOUTHERN West Texas, as a new oil and gas-producing province, got another boost last week, at Standard Oil Co. of Texas 2 Hokit, in Pecos County. Two separate zones in the Pennsylvanian looked very promising.

The Sheffield Channel, shown shaded on the accompanying map, is generally conceded to be a buried feature connecting the Delaware basin on the west to the Val Verde basin to the southeast.

Val Verde basin is the southeast continuation of the Delaware basin. Drilling problems common to both basins caused by quartzitic sands of Wolfcamp and Pennsylvanian age make for slow and expensive drilling. These facts, plus the great depths to pre-Permian beds have limited exploration efforts.

But major oil companies have looked to this area for the past several years as a coming oil province. Nine active wildcats in Pecos County alone, scheduled below 10,000 ft., indicate the faith operators have for this area.

Stanotex 1 Hokit . . . This is the latest wildcat to show oil and gas. First shows came on a drill-stem test in Pennsylvanian Strawn, at 9,436-63 ft., flowed gas at the rate of 1,800 to 17,000 M.c.f. per day, plus 4 to 5 bbl. of distillate per hour. Recovery in the pipe following the test was 250 ft. of distillate, with no water.

In a deeper section of the Pennsylvanian, a 3-hour test at 9,464-9,506 ft. had gas in 12 minutes, flowing at the rate of 250,000 cu. ft. per day through ¾-in. choke. Recovery was 230 ft. of slightly oil and gas-cut mud, 200 ft. of the same, only heavily cut, 25 ft. of clean oil and 5 ft. of water. Bottom-hole shut-in pressure was 1,190 psi. in 30 minutes.

Location of 1 Hokit is in Section 7, Block 127, T&STL. Survey. It is 1½

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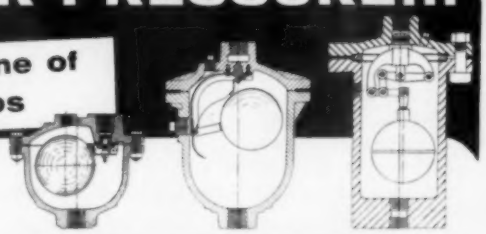

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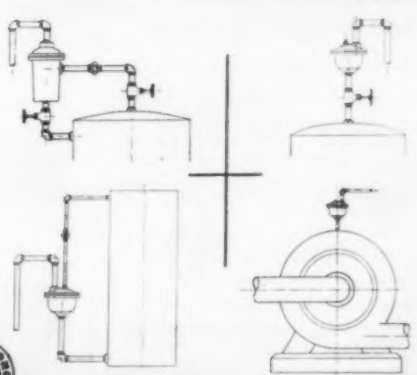

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miles south of an 8,055-ft. dry hole, and the only nearby production is Puckett field, 8 miles to the southwest. Drilling continued below 9,530 ft., on an 11,000-ft. contract.

Depth record setter . . . Pan American Petroleum Corp. 1 University "CS," 15 miles southeast of Fort Stockton, in Pecos County, was drilling below 18,986 ft. at last report, and was making 35 ft. per day.

The present depth is the deepest for West Texas, having exceeded Gulf Oil Corp. 1-A Northrup's mark of 18,771 ft., in Reeves County. This well was dry at 18,709 ft. in side-tracked hole.

Pan American Petroleum's well, at 18,986 ft., was still above the Devonian.

Deeper project . . . If Pan American Petroleum's test exceeds the Texas depth record of 20,060 ft., reached by a Magnolia Petroleum Co. well in Jackson County on the Gulf Coast, it may not hold the record long. Great Western Drilling Co., as contractor, was drilling ahead at Phillips Petroleum Co. and Sinclair Oil & Gas Co. 1 Montgomery "A," which is scheduled to 22,000 ft.

Location of the proposed 22,000-ft. wildcat is 13 miles southeast of Fort Stockton, and about 10 miles southwest of 1 University "CS." Description is Section 17, Block 134, T&STL Survey.

In eastern Pecos County, Stanotex 14 Cannon was bottomed at 10,217 ft., in Ellenburger dolomite, and preparing to drill-stem test.

Top of the Ellenburger was 10,150 ft., minus 7,530 ft., by samples. A core from 10,167-10,217 ft. recovered 7 ft. of dolomite, 12 ft. of salty dolomite, 9 ft. of dense dolomite with a few fractures, 2 ft. of granite, 3 ft. of dense dolomite with small fractures and slight shows, and 17 ft. of slightly fractured dolomite with oil and gas shows. No. 14 Cannon is southeast of Sheffield-Ellenburger field, in Section 15, Block C-3, EL&RR Survey.

Phillips Petroleum Co. 1 University "EE," 12 miles east of Fort Stockton, and near the northern edge of the channel, was drilling below 15,087 ft. in dolomite. The last test reported small gas shows around 13,184 ft. Protected depth is 18,500 ft.

The same operators' 1 Harrall "A," proposed 18,000-ft. test 15 miles southeast of Fort Stockton, was drilling below 7,173 ft.

Humble 1 Edwards, 10 miles southeast of Puckett field, stopped at 17,880 ft. to run electrical surveys. Initial drill-stem tests in the Ellenburger around 17,500-17,880 ft. had no shows.

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TULSA . . . MEMPHIS

Frio County Discovery Opens New Olmos Field

Frio County has a new Olmos (Navarro) sand field. Discovery is by H. B. Kaulback, of San Antonio, at his 1 McDonald, in Section 173, Heirs Camilla Cuples Survey, in the northeastern part of the county.

Location is nearly 3 miles south of the west end of the expansive Big Foot field, and about 12 miles northeast of Pearsall. Nearest production of any kind has been in the Schattel area, about a mile northeast, where one well, drilled in 1938, produced for a short time from Austin chalk.

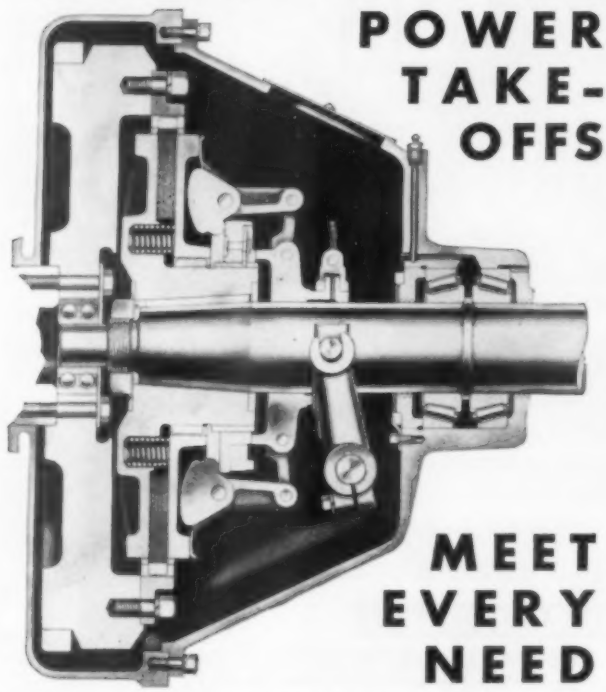
Kaulback's discovery well flowed 110 bbl. of 37°-gravity oil per day while testing through 5/32-in. choke. Flow was with pressure of 285 psi. on the tubing, and 550 psi. on the casing. Gas-oil ratio was 200 cu. ft. per barrel.

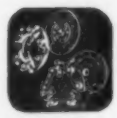
Completion is in open-hole section at 3,597-3,614 ft. Pay is believed to be the Olmos "B" sand, which had promising oil shows in other tests in the general area.

LOCATION of new Olmos oil discovery in northeastern Frio County. Schattel field, northeast of discovery, had one short-lived Austin chalk well, abandoned in 1938.

ROCKFORD

POWER TAKE-OFFS

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CLUTCHES

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ALBERTA

White Rose-C.&E. 1-16 Innisfail, LSD 1, 16-35-1w5. TD 8,650 ft. D3 oil discovery.

Phillips 1 Kaybob, LSD 7, 22-64-19w5. TD 9,800 ft. Slave Point oil discovery.

Sohio-Devon-Palmer 15-3 Stoughton, LSD 15, 3-9-8w2. Mission Canyon oil well. TD 4,126 ft.

Hudson's Bay et al 1 Trust Crown, LSD 10, 27-42-13w4. TD 3,503 ft. Ostracod gas well.

Dernick Guyer-Cal. Standard 4-12 Sterling, LSD 4, 12-7-19w4. Bow Island gas well. TD 3,765 ft.

BRITISH COLUMBIA

Pacific 90 Fort St. John, LSD 2, 13-86-20w6. TD 6,423 ft. Permo-Penn gas discovery.

SASKATCHEWAN

Gridoil-Canadian Superior 14-33 Weyburn, LSD 14, 33-6-14w2. Charles oil well. TD 4,652 ft.

ARKANSAS

Nevada County: N.B. Hunt and Continental 1 Silvey "A," SE SW NE 24-14s-22w. IPP 38 BOPD, 2 BWPD, Nacatoch sand 1,208-16 ft. TD 1,288 ft. New pay in West Willisville pool.

Miller County: Crown & Christmas 1 Young, C NW NW NW 15-16s-27w. IPP 108 BOPD 37°, Paluxy 3,388-91 ft. TD 3,803 ft. Opens Genda pool.

Lafayette County: Gulf Oil Corp. et al 1 M. B. Maryman, NWc NE 16-19s-25w. IPF 114 BOPD, 13 BWPD, 40.4°, Mitchell sand 5,834-38 ft. TD 5,924 ft. Opens Walnut Hill pool.

COLORADO

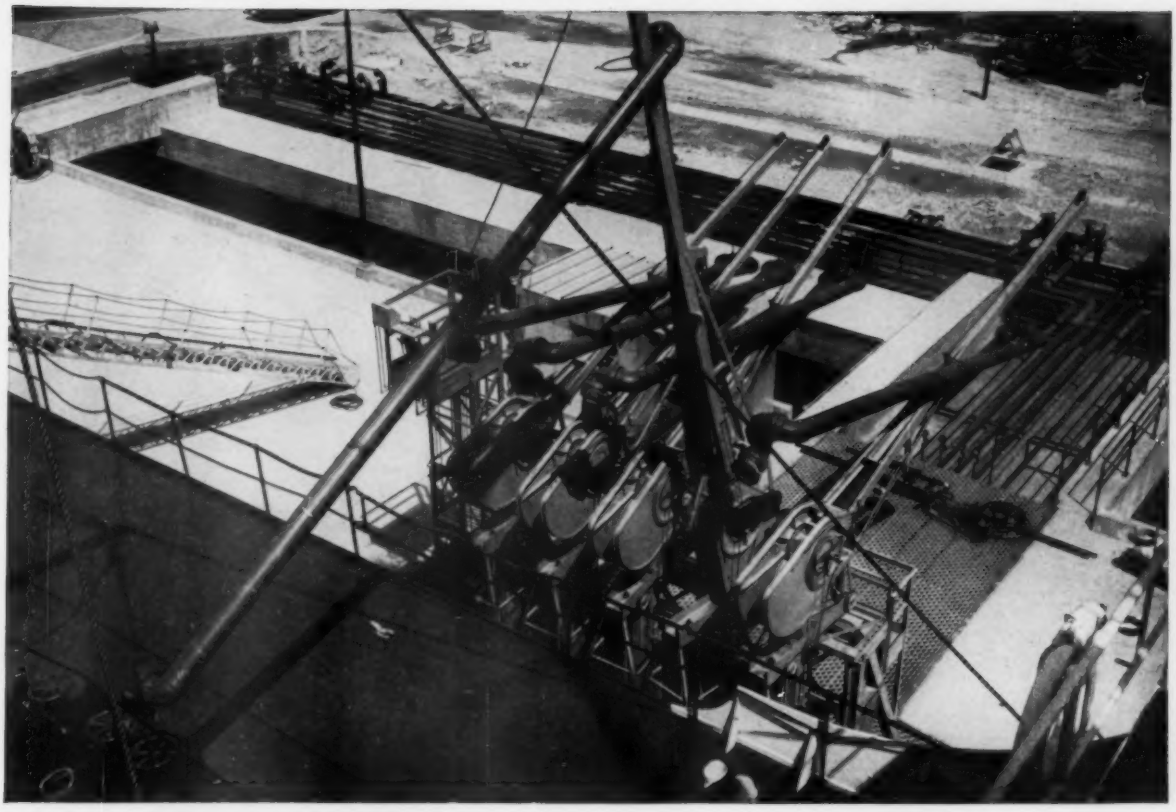
Moffat County: Malco Refineries 1 Kowach, C NW NW 25-6n-90w. IPF 221 BOPD, Weber discovery, new pay. TD 10,200 ft. Weber.

Washington County: Petroleum, Inc. 1 Peck "C," C SE SW 15-1n-54w. IPP 109 BOPD, "J" sand discovery, new field. TD 5,065 ft. "J" sand.

Kimbark Co. 1 Wenig, C NW NW 23-2n-54w. IPP 23 BOPD, "J" sand discovery, new field. TD 4,839 ft. "J" sand.

ILLINOIS

Wabash County: Henry P. Smith 1 Ankenbrandt, NW SW NE 11-1s-14w. IPP 10 BOPD, 2 BWPD, McClosky zone 2,925-30 ft. TD 2,935 ft. Extension to North Lexington pool.



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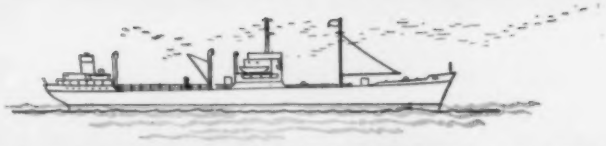

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Williamson County: Ross Bartmes 1 Roberts, Minerals, SE SE SW 21-8s-4e. IPP 50 BOPD, 1 BWPD, Aux Vases 2,886-2,906 ft. TD 3,018 ft. Opens Corinth pool.

INDIANA

Vanderburgh County: Buchman & O'Neal-Wausau Petroleum Co. 1 F. R. Harris Unit, SE NW SE 19-5s-11w. IPP 136 BOPD, 22 BWPD, Aux Vases 2,606-27 ft. TD 2,735 ft. Opens North Vienna pool.

KENTUCKY

Christian County: Ralph Wilson 1 Shraber, 7-G-26. IPP 10 BOPD, 3 BWPD, O'Hara 780-787 ft. TD 787 ft. Extension to Apex Consolidated pool.

Hopkins County: Stouder & Ashland 1 Davis, 15-I-25. IPP 109 BOPD, 13 BWPD, McClosky 2,154-68 ft. TD 2,239 ft. Discovery of West Oakhill pool.

Daviess County: George A. Hoffman 1 Ura Fogle, 23-P-27. IPP 29 BOPD, Paint Creek sand 1,732-45 ft. TD 2,026 ft. Extension to Birk City pool.

MICHIGAN

Oceana County: Swan-King Oil Co. and W. L. Harvey 1 Skidmore Land Co., SW NE NE 15-16n-16w. Dundee 2,496 ft., 40 BOD after acid from pay at 2,498-2,514 ft. TD 2,587 ft. (New pool.)

NORTHWEST NEW MEXICO

San Juan County: Rex Uranium Co. 1 Douthit, C NW NE 8-27n-13w. IPP 110 BOPD, Tocito discovery, new field. TD 5,490 ft. Mancos.

TEXAS GULF COAST

Jackson County: Midhurst Oil Corp. and Ogden & White 1 Jolly, H. W. Munson Sur., A-57 (8 miles southeast of Edna). IP 237.42 BOPD, 11/64-in., 46°, GOR 786 cu. ft. per barrel, TP 1,025 psi., perf. 7,361-69 ft. (Frio). TD 7,501 ft. (New field.)

Kleberg County: Standard Oil Co. of Texas 947-55 State, State Tract 947, Gulf of Mexico. IP 1,100 M.c.f. daily (3-hour gage), $\frac{5}{16}$-in., 32 BCPD, 58.7°, TP 2,125 psi.. perf. 6,827-47 ft. (Miocene). TD 7,003 ft. (New pay in Chevron offshore field.)

Orange County: Beck Oil Co. 1 Craft, James Dyson Sur., A-8. IP 81.20 BOPD, 7/64-in., 22.3°, GOR 315 cu. ft. per barrel, TP 315 psi., perf. 3,512-22 ft. (Miocene). TD 7,208 ft. (New pay in North Orange field.)

Refugio County: Tennessee Gas Transmission Co. 1-H Hynes, Isabella O'Brien Sur., A-6, (5 miles north of Refugio). IP 12 BOPD, ¼-in., 41°, GOR 400 cu. ft. per barrel, perf. 6,546-53 ft. (Frio). TD 8,005 ft. (New reservoir in Refugio area.)

WEST CENTRAL TEXAS

Callahan County: S. C. Herring 1 Claxton Jones, Sec. 29, D&DA Sur., 8 mi. SE Baird. IP 94 BOPD, 14/64-in., 42-gravity, GOR 430, TP 180 psi., Caddo 3,318-26 ft. TD 3,794 ft.

Taylor County: Chapman Oil Co. 1 W. A. Nelson, Sec. 16, LAL Sur., 3 mi. SE Abilene. IP 91 BOPD, $\frac{3}{8}$-in., 37-gravity, GOR 320, TP 85 psi., Flippen sand 1,786-99 ft. TD 2,210 ft.

WEST TEXAS

Andrews County: J. C. Williamson et al 1 Puntam, 5-A47-PSL, 15 mi. W Andrews. IP 124.6 BOPD, 20/64-in., 33-gravity, GOR 10,924:1, TP 760 psi., Grayburg 4,450-60, 4,492-4,508 ft. TD 4,530 ft.

Gaines County: Magnolia Petroleum Co. 1 George Norman estate, Sec. 9, Blk. C-45, PSL, 11 mi., SE Seminole, IPP 214 BOPD, 29-gravity, Wolfcamp 9,149-56, 9,167-73, 9,180-84, 9,191-9,200 ft. TD 12,-368 ft. Elev. 3,202 ft., top Devonian 12,-357 ft.

Garza County: Paul C. Teas 2 Slaughter, 40-2-T&NO Sur., 10 mi. S Post, IPP 127.6 BOPD, 38-gravity, GOR 600, Spraberry 5,878-94 ft. TD 6,400 ft., elev. 2,465 ft.

Howard County: Standard Oil Co. fo Texas 1 Willis Winters, 6-25-H&TC, 8 mi. NE Vincent. IPP 20 BOPD, 34-gravity, Spraberry 5,049-58 ft. TD 5,690 ft.

Pecos County: Tidewater Oil Co. 1 White & Baker Ranch "B," 87-194-GC&SF, 17 mi. W Iraan, ½ mi. E Walker Queen and Grayburg field. IPP 221 BOPD, 34-gravity, GOR 365, Canyon perforations 7,228-57, 7,264-78, 7,310-30 ft. TD 9,587 ft., elev. 3,077 ft.

Yoakum County: Stritex Oil, Inc., 1 Carter, Sec. 536, Blk. D, J. H. Gibson Sur., 11 mi. SW Plains. IPP 198 BOPD, 32-gravity, San Andres 5,308-28 ft. TD 5,372 ft.

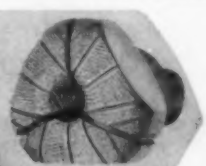
WEST VIRGINIA

Tucker County, Licking district: Hope Natural Gas Co., 10072 W. Asa Street, elevation 1,986 ft., 778,000 cu. ft. gas, after fracture, rock pressure 1,930 psi. in 72 hours, chert 4,408-4,598 ft., gas 4,478 ft., Oriskany sand 4,598-4,703 ft., gas 4,765 ft., Helderberg 4,703 ft., gas 4,792 ft. TD 4,835 ft.

WYOMING

Campbell County: Midwest Oil Co. 1 Krouse, C SW SE 25-49n-69w. IPF 4 BOPH, Newcastle discovery. TD 6,855 ft. Newcastle pay.

HARNESS ALL YOUR HORSEPOWER



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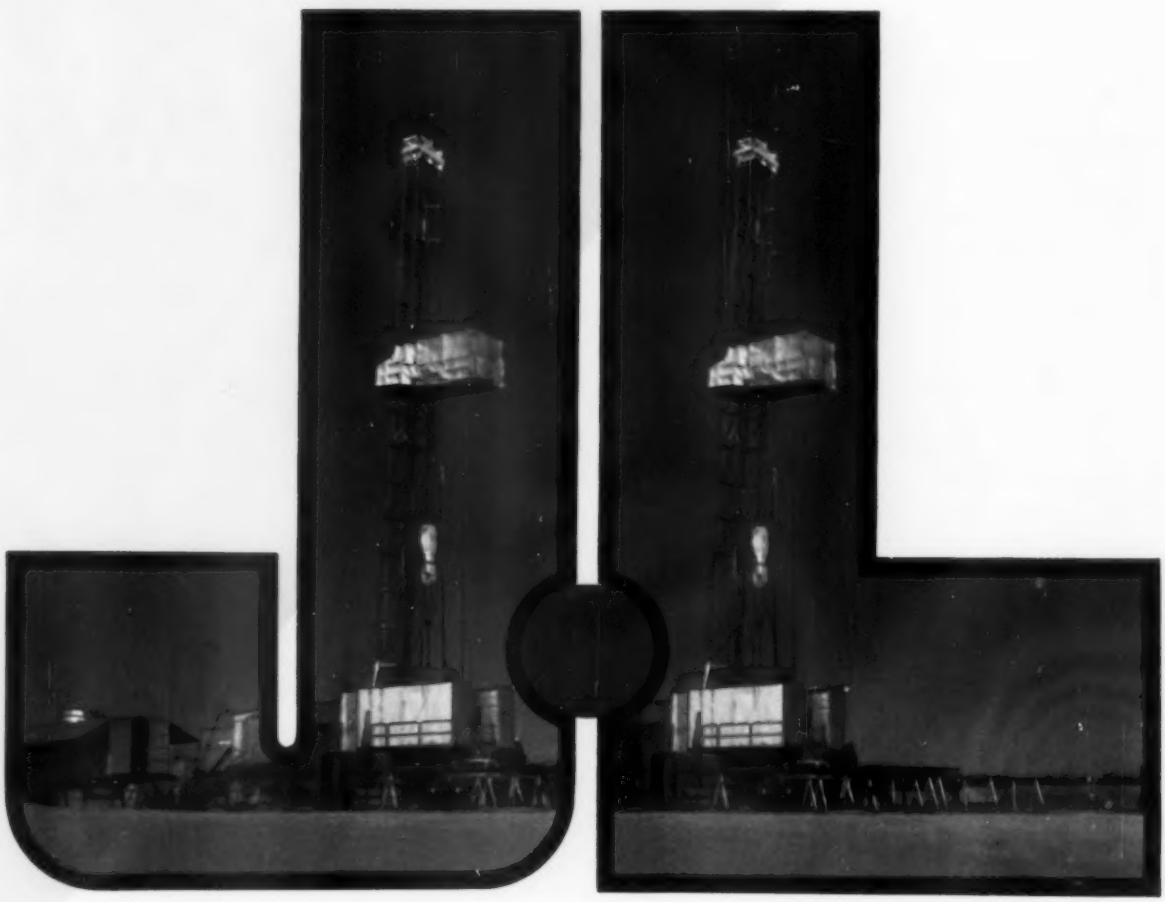
On this page a Nebraska scene featuring J&L Supply equipment tailor-made to a major oil company's requirements by Ideco. Diesel electric dual Rambler rig with 105′ Kwik-Lift mast and "E-525" drawworks.



Ideco Mechanical, Electrical, or Hydrair rigs and streamlined rotaries give a driller the feeling that everything's coming his way. And everything is; he has complete control and knows it. Ideco—the most wanted drilling equipment in the world! One third of all rotary tables are Ideco! Table openings from 12″ to 27½″; capacities from shallow workover to deepest drilling. Rig capacities (4½″ drill pipe) to 25,000′. Rigs to 6,000′ capacity can be trailer mounted.

Jones & Laughlin's standard rotary drilling lines with IWRC are made to the industry's most exacting standards to give the driller the utmost in strength and life. In addition, J&L offers SpringKore rotary drilling lines that bring a new concept to rotary drilling with great crush resistance, more internal lubricant, and the greatest flexibility, all of this at the lowest steel center cost. For cable tool drilling, J&L's PlastiKore has a center impervious to acids, salt water, and caustics that so frequently cause early failure in standard fiber center lines.

Nothing adds more to the confidence of a driller than J&L Blue Ribbon Drill Pipe. This is the drill pipe that digs the world's deepest wells with the greatest safety. This is drill pipe inherently right. J&L Supply service goes with it everywhere, alert, informed, helpful. Internal or external upset. Blue Ribbon Heat-treated Alloy Steel, or Blue Ribbon plus Vanadium. Upset for grip type, counterbore weld and flashweld tooljoint application.

Fast (low center of gravity) Ideco Shorty Blocks add as much as 9′ of headroom when unitized with the spring-loaded hook — and they are made to add ton-miles to wire line endurance. To this end the "Fabriform" sheaves are balanced on Double Tapered Timkens for positive alignment regardless of fleet angle or line load, and the roll-forged flame-hardened rims are smooth — even the grain structure is uniform. Automatic safety lock, ingenious hook, and a patented hydraulic cushion provides jarless starts and stops. The Ideco Shorty teams up with the Ideco crown block to give capacities to 560 tons, for truly dependable performance.

Republic Rotary Hose and Ideco Streamlined Swivels give drilling mud a trouble-free right-of-way. The Ideco floating washpipe can be repacked by one man in about 22 minutes with a sealed packing assembly stocked by J&L Supply. The swivel is then normally ready for many more wells before washpipe or packing needs further attention. As for the Republic hose — the higher the pressure the tighter the seal, thanks to the patented connection.

Left, Franks Cruiser. Single or double drum hoist and single or double pole mast with pulling capacities of 2,500′ to 12,000′ depending on the model. Choice of gas, gasoline, LPG, or diesel engine. Hard brake flanges; full-air clutches; one-point brake adjustment; simple, convenient controls. Torque converter drives, and hydraulic equipment for power tongs and other time- and labor-saving devices if desired. Unit anchors quickly and easily under conventional derrick. Can be driven away from pole mast for remote swabbing. The Franks Cruiser justifies its great popularity with J&L customers.

Right, Franks Clipper. Three sizes, with pulling capacities to 14,000′. Low center of gravity. Even weight distribution. Fully protected cab. Heads into location — important when the approach is difficult. Widespread outriggers, balanced for one-man positioning. Telescoping derrick hydraulically operated; automatic lock and stacking board. Remote console gives operator unobstructed view and positive control of the fast, flexible unit. Optional features include hydraulic drive for power tongs and other equipment. Most advanced unit on the market for servicing and workover.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN SUPPLIES

EDWIN J. GOHR

When Esso developed fluid cracking . . .

Ed Gohr Helped Lead the Way

ED GOHR has a rather inconspicuous souvenir that tells a big story. The souvenir is a little bottle containing the first sample of product taken from the world's first fluid catalytic cracking unit (see photo).

Gohr personally took the sample at 4:45 a.m., May 25, 1942, at the Baton Rouge refinery of Standard Oil Co. (N. J.). Today 75 per cent of the world's catalytic cracking is done by the fluid process.

The development speaks highly of Ed (Edwin J.) Gohr, a vice president of Esso Research & Engineering Co. He played a major role in putting the Baton Rouge plant on stream at a time when the nation was plunging into World War II.

How he started . . . Gohr joined Jersey in 1927 as part of an unusual "package deal" that produced for the company more executive talent than perhaps any other similar group of technicians in industrial history.

It happened shortly after Jersey obtained rights to I. G. Farben's coal-hydrogenation processes. A research laboratory was set up at Baton Rouge, and a search for talent to staff the operation began.

Jersey appealed to R. T. Haslam, a chemical engineering professor at Massachusetts Institute of Technology, and Haslam responded by joining the Jersey organization himself and bringing with him R. P. Russell, head of the M.I.T. research laboratory of applied chemistry, and a dozen others.

Haslam, the one teacher in the group, went to New York, while Russell went to Baton Rouge and took with him a group of young men destined to become top executives of Jersey. Gohr, a member of Russell's staff at M.I.T., was among them.

The M. I. T. group eventually produced three directors of the parent company, a president and two vice presidents of Esso Research & Engineering, and a half dozen other executives.

Catalysis progress . . . Gohr and those at Baton Rouge learned from their hydrogenation research the commercial possibilities of catalysis. In the early 1930's Gohr worked on this and other processes at Linden, N. J.

Then, in 1936, the Houdry catalytic cracking process was disclosed, and Jersey undertook to develop its own process. Out of this research came "fluid" cat cracking.

Gohr headed the group that designed the first large pilot plant for the process at Baton Rouge, but the wartime emergency made it necessary to design commercial size units before all pilot-plant studies were completed. Ultimately, however, some 30 units were built on the basic design of the pilot plant, and Jersey built eight of them.

The first units operated under severe conditions to get maximum yield of aviation gasoline and synthetic-rubber components on a once-through basis.

The souvenir bottle in Gohr's Manhattan office is the reminder of the first such commercial unit and his role in its development.

In 1945 Gohr was appointed assistant manager of the research and development department of what is now Esso Research & Engineering Co., and in 1949 he was elected a vice president. His field, then and since, has been petroleum fuels processes.

Wide range . . . Under Gohr's guidance, Esso research has worked on such things as synthetic fuels and shale retorting. It has developed Powerforming, Fluid coking, and Hydrofining processes, and it has improved such processes as alkylation and cat cracking.

Gohr takes no personal credit for developing the fluid catalytic cracking process. It was a group operation, and he expresses pride in being part of the group.

Gohr has a rather ascetic appearance that belies a first-rate sense of humor. His office is spacious and comfortable, but it is plainly furnished. The only decorations are enlarged photos of Jersey refineries.

If the souvenir bottle of fluid from the Baton Rouge plant seems out of place, it's not. Gohr's pride in it is well justified.

Gene F. Daniel has been transferred by Tennessee Gas Transmission Co. from Odessa, Tex., where he was area engineer, to Hobbs, N. M., as petroleum production engineer.

R. D. Meagher has been appointed assistant manager of the Calgary refinery of British American Oil Co., Ltd. Meagher has been with British American since 1938. He was formerly project engineer in the manufacturing engineering department.

Leo Lauber, Sinclair Oil & Gas Co.'s assistant district foreman at Seminole, Okla., has been promoted to district foreman at Lindsay, Okla. He succeeds **Francis P. Carson,** who has been transferred to Woodward, Okla. In other moves, **Arthur L. Vickers,** roustabout at Seminole, has been promoted to assistant foreman in Covington, Okla. **Robert R. Quier,** assistant foreman at Covington, has moved to Seminole.

Personals

H. F. LONGREN

H. F. Longren is slated for promotion September 1 by The Texas Co. from assistant district superintendent of Texaco's West Texas - New Mexico district at Midland, Tex., to superintendent of a newly formed Four Corners district at Farmington, N. M. **C. H. McCool,** field foreman in the Four Corners area, will be promoted to assistant district superintendent. **U. E. Johnson,** district reservoir engineer at Wichita Falls in North Texas, will become district petroleum engineer at Farmington. District geologist at Farmington is **A. P. McConnell, Jr. C. P. Farmer,** assistant district superintendent in the Panhandle office at Pampa, Tex., will replace Longren at Midland.

William T. Ivey, statistician and planning engineer for Southern Natural Gas Co., Birmingham, has been appointed a member of the execuive committee of the pipeline technical division of the American Society of Civil Engineers.

Jed B. Maebius has been named senior geologist for domestic exploration for Tidewater Oil Co. in San Francisco. Maebius has been a consulting geologist in Tulsa the past 2 years and before that spent 20 years with Gulf Oil Corp.

Harry S. Lain, staff geologist in Seaboard Oil Co.'s Dallas headquarters, has been promoted to district geologist at Midland, Tex. Seaboard also is transferring **C. R. Winkler** from Midland to Amarillo and **James D. Webb** from Amarillo to Midland. Both are staff geologists.

Esso Standard Oil Co. has reorganized its supply department by replacing three divisions with four new ones. New division managers are: **D. B. Voorhees,** operations, former head of distribution; **P. F. Hawkins,** program, former head of supply; **K. O. Johnson,** economics, formerly a section head in distribution; and **R. A. Nelson,** contract, former assistant general manager of the department. **C. J. Everett,** head of the former tonnage and tankers division, takes Nelson's place as assistant general manager. **J. L. Keener, Jr.,** continues as head of the product exchanges and purchases division, which was not affected.

Dr. Chilton Eaton Prouty, geological department faculty member at the University of Pittsburgh, has resigned to become head of Michigan State University's geological department.

John E. Mullins has been promoted by Laual Underground Surveys from engineer in Fresno, Calif., to district engineer in Bakersfield, Calif.

Elmer F. Blake has been named vice president in charge of Rocky Mountain operations for Southern Geophysical Co. at Denver. Blake recently rejoined the firm after resigning in 1954 to become a consultant.

Sam T. Coleman, Tulsa independent, has been elected vice president and a director of Sneed Oil Co. As a director he succeeds the late Mrs. Nettie Sneed.

L. L. Crawford, Jr., and **J. A. Pranter** have joined the Houston production department of Shell Oil Co. Crawford will be junior exploitation engineer; Pranter, junior mechanical engineer.

C. B. Caruthers has been named field superintendent for Pan American Petroleum Corp. at Iraan, Tex. He succeeds **F. H. Clements,** transferred by Pan Am to Venezuela.

Delbert L. Dugan has left Tennessee Gas Transmission Co. where he was district petroleum engineer in Hobbs, N. M., to join Nebo Oil Co. in Dallas as petroleum engineer. Dugan was recently transferred by Tennessee Gas to Hobbs from Fort Worth.

Julius Aronofsky, research associate and leader of the applied mathematics group at Magnolia Petroleum Co.'s field research laboratory near Dallas, has been transferred to Socony Mobil Oil Co., Inc., at New York and promoted to manager of the firm's New York electronic computer center. He will be responsible for the organization and operation of the center and will coordinate this work with that of Socony's affiliated companies. **Lucien Masse** will replace Aronofsky at Magnolia's Dallas field research lab.

Joe Reese has been transferred by Zapata Petroleum Corp. from Midland, Tex., where he was a staff geologist in the headquarters office to Farmington, N. M., in charge of a newly opened office there. Reese will direct acquisition of oil and gas leases and farmout drilling deals in the Four Corners area for Zapata Petroleum and also represent its subsidiary, Zapata Drilling Co., in contract-drilling work.

Robert N. Williams has been named consulting geologist with Empresa Nacional del Petroleo (E. N. A. P.), oil agency of the Chilean Government. Williams was formerly chief geologist with Coronet Oil Co. in Midland, Tex.

M. J. Bender, Magnolia Petroleum Co. geologist, has been transferred to New Orleans from Roswell, N. M.

Frank M. Foster, vice president of Southern California Gas Co. at Los Angeles, has been elected a director.

R. L. Hockley, Baltimore chemical consultant, has been elected a director of Amoco Chemicals Corp. Hockley is a former vice president of Olin Mathieson Chemical Corp.

E. G. Ballmer has been promoted to junior resident engineer for General Petroleum Corp. in its Ventura, Calif., production office. Ballmer joined the firm in 1955.

Russell E. Hayward has been named chief geologist for Canadian operations by Alex W. McCoy Associates, Inc. He will headquarter in Calgary. Hayward was assistant zone exploration manager for Gulf Oil Corp. in Oklahoma City before joining the consulting firm.

A. C. Brown, district superintendent for Okan Pipeline Co. in western Kansas, Oklahoma, and West Texas, has been transferred by Warren Petroleum Corp., the parent company, to Lovington, N. M., where he will be superintendent of Warren's Saunders, N. M., gasoline plant. **John H. Strader** will succeed Brown as Okan Pipeline district superintendent.

Seven scientists and engineers at the La Habra Laboratory of California Research Corp. have been promoted by the new laboratory director, **Alex Hildenbrand.** The promotions: **O. A. Fredericksson** to group supervisor in geophysics development; **L. P. Stephenson** to group supervisor in geophysics research; **L. W. Thrasher** to group supervisor in offshore drilling research; **T. D. Mueller** to group supervisor in reservoir mechanics; **Lars Skjelbreia** to senior research engineer in drilling research; **E. E. Johnson, Jr.,** to group supervisor in fluid flow research; and **A. E. Worthington** to senior research physicist in well logging research.

John H. Kime, superintendent of production and storage for United Fuel Gas Co., has been transferred to Preston Oil Co., an affiliate, as vice president in charge of drilling and development operations. Both are operating companies of Columbia Gas System. Kime has been with United Fuel Gas since 1946. He was named superintendent of production and storage last year.

Delmar Cox has been transferred by Blackwell Oil & Gas Co. from Cushing, Okla., where he was district engineer, to the Tulsa general office for duty as petroleum engineer.

William O. DeVries has been appointed Amerada Petroleum Corp.'s production foreman in Plentywood, Mont. He was formerly foreman in Tioga, N. D.

J. G. Hough, general superintendent of petrochemical manufacturing for Continental Oil Co. since 1953, has been promoted to assistant general manager of the petrochemical department. **Paul E. Geiser,** who was named director of petrochemical product quality earlier this year, has been appointed manager of the detergents division, petrochemical department. **W. B. Strobel,** director of petrochemical projects development, has been named manager of the department's chemicals division. Geiser will be responsible for general business operations of Conoco's Chicago and Baltimore petrochemical plants and Strobel will be responsible for plants in Gretna, La., and Trainer, Pa.

L. J. White has been promoted by Magnolia Pipe Line Co. from district superintendent of the firm's Houston-Beaumont district to division superintendent of the southern division at Houston. **R. E. McDonald** has been transferred to Alice, Tex., as superintendent of the Southwest Texas district. **Homer Cranfill,** former district superintendent at Alice, has been transferred to Wichita Falls, Tex., as superintendent of the company's North Texas district. **J. R. Dean,** formerly district head at Wichita Falls, moves to Beaumont to replace White as Houston-Beaumont district superintendent. **L. A. Foy,** district superintendent at Midland, Tex., has been promoted to assistant superintendent of Magnolia Pipe Line's western division there. **J. J. Harris** has been transferred to Midland to replace Foy as West Texas district superintendent.

L. T. Potter, recently elected president of Lone Star Gas Co., has been elected president of that company's wholly owned subsidiary, Lone Star Producing Co.

L. H. Kramer, production foreman for Petro-Atlas Corp. in Victoria, Tex., has been promoted to production superintendent and transferred to Farmington, N. M.

William D. Orthwein has been promoted to Oklahoma division exploration manager for W. C. McBride, Inc. He will also manage McBride's Tulsa office. Orthwein was formerly land coordinator.

John Emery Adams has been named senior staff regional geologist for Standard Oil Co. of Texas in Midland, Tex. Adams has been with the company since 1927. A graduate of the State University of Iowa, Adams served as president of American Association of Petroleum Geologists in 1953.

T. E. DeVilliers, Gary, Ind., has been named manager of the Cities Service Oil Co. Cicero compound plant and marketing warehouse-terminal at Chicago. DeVilliers fills a vacancy created by the transfer of **Don V. Eells** to the Cities Service headquarters office at Bartlesville, Okla., to serve as staff assistant to **W. T. Cravens,** refining vice president. **H. C. Inlow,** of the company's Bartlesville technical department, is being transferred to Chicago to serve as DeVilliers' staff assistant. DeVilliers has been serving as chief chemist in charge of the company's East Chicago technical service laboratory. His assistant at the laboratory, **W. M. Price** of Gary, will take over as the new laboratory superintendent.

Personals

Jerry B. Allen, engineer, has been transferred by Pan American Petroleum Corp. from Cody, Wyo., to Rangely, Colo.

Charles A. Miller has been promoted by Magnolia Petroleum Co. from assistant superintendent to superintendent of the Kermit, Tex., producing district. He replaces the late E. G. Blundell.

Jim Stroh has been transferred by Skelly Oil Co. from Casper, Wyo., to Sterling, Colo., where he will be district geologist. He succeeds **Joe Morgan,** recently transferred to Tulsa.

W. L. Falconer, executive vice president of Amurex Oil Co., has been elected president succeeding **C. H. Murphy, Jr.,** of Murphy Corp. Murphy will continue as a director. **Vernon Van Sant, Jr.,** will succeed Falconer as executive vice president.

Joseph O. Fair has been named superintendent of a new district production office opened in Denver by Pan American Petroleum Corp. **A. M. Roney** is district engineer. **Martin O. Heggland** was appointed assistant division engineer, and **Robert S. Sloan** district engineer. **K. W. Beaver** has been named field engineer of the Salt Creek area at Midwest, Wyo. **J. E. Land** has been promoted to field superintendent and **R. W. Moore** to field clerk in Powell, Wyo. The Denver office will supervise drilling and production in Utah and Nevada; most of Colorado; western Nebraska; and Platte, Goshen, and Laramie counties in Wyoming.

DEATHS

Harold L. Strader, 54, owner of Harold L. Strader Drilling Co., died August 2 in Houston. Strader was with John W. Mecom as designer and supervisor of the drilling barge program before founding his own drilling company in 1954. He was division petroleum engineer with The Texas Co. in Houston before going with Mecom in 1950.

Brewer Taylor McNeil, 64, who retired in 1952 as vice president of McEvoy Co., died August 5 in Houston. He had been ill for the past year.

Frank G. Wood, Great Bend, Kans., independent and drilling contractor, died August 4 in Great Bend after a heart attack.

Dr. Harold R. Snow, 61, vice president in charge of manufacturing for American Oil Co. and formerly manager of the company's Texas City, Tex., plant, died recently in Galveston, Tex.

F. Ray Peterson, 55, assistant to the president of R. G. LeTourneau, Inc., died July 29 at Longview, Tex., after a heart attack.

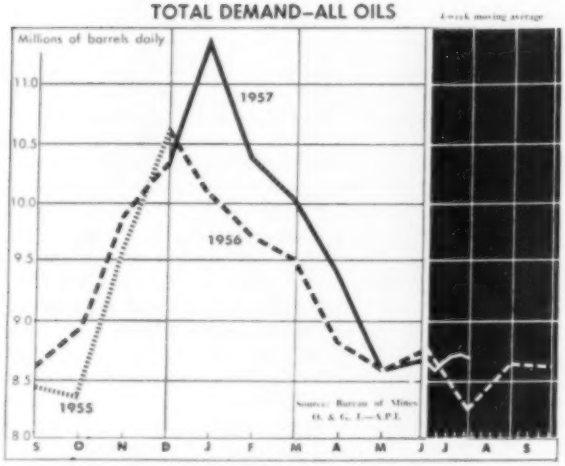
C. Jim Creekmore, Tulsa, owner of Creekmore Drilling Co., died August 1 at his summer home on Grand Lake near Langley, Okla. He was 51.

Lloyd Lyle Griffith, 82, retired Magnolia Petroleum Co. engineer, died August 2 at his home in Silsbee, Tex.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,877,850	DOWN	31,100	DOWN	296,920
Crude stocks	285,241,000	DOWN	641,000	UP	8,201,000
Completions	1,113	UP	32	DOWN	121
Refinery runs	7,936,000	UP	173,000	DOWN	28,000
Gasoline stocks	176,360,000	UP	662,000	DOWN	1,201,000
Kerosine stocks	31,454,000	UP	843,000	UP	2,039,000
Distillate stocks	138,072,000	UP	4,250,000	UP	18,783,000
Residual stocks	48,943,000	UP	206,000	UP	4,345,000
Four-product stocks	394,829,000	UP	5,961,000	UP	23,966,000
Total imports	1,883,400	UP	226,000	UP	457,800



Supply Must Be Reduced to Correct for Stock Additions in the Second Quarter

MANY MARKETERS of petroleum products have been and still are very disturbed by continuing high inventories. These excess stocks have resulted in a pressure on product prices that has been hard to shake off. The pressure from gasoline stocks has eased up over the past few weeks, but distillate movement is much below normal.

Here are the figures that show how the situation developed. The total of all crude and product stocks was high at the end of last year with most of the excess in products.

Total inventories amounted to 780,000,000 bbl., up about 66,000,000 bbl. from the year before. Refined-product stocks accounted for 58,000,000 bbl. of the increase and gas liquids another 7,000,000 bbl.

Total demand was very high in the first quarter, but most of the increase was due to emergency shipments to Europe during the Suez crisis. Product stocks dropped at the rate of 581,000 bbl. daily, the highest withdrawal rate since the end of World War II.

The trouble came in the second quarter. Demand slowed down, but supply stayed in high gear. The result was another big gain in stocks.

For the 5-year period 1952-56, the average drop in total demand from the first to the second quarter was 941,000 bbl. daily. For the 3-year period 1954-56, the drop averaged about 1,000,000 bbl. daily. These reductions were mild compared with the demand shift this year.

Total demand averaged 10,618,000 bbl. daily in the first and is estimated at 8,860,000 bbl. daily for the second quarter of this year. This decrease of about 1,750,000 bbl. daily should have been matched by a big reduction in supply. But, the cutback in supply was less than normal.

For the 5-year period 1952-56, total supply decreased 241,000 bbl. daily from the first to the second quarter. This year the reduction was only 100,000 bbl. daily.

This larger-than-normal drop in demand coupled with a smaller-than-normal reduction in supply resulted in a stock gain that topped anything in the record books. Crude and product stocks increased almost 86,000,000 bbl. in the second quarter. Crude accounted for about 26,000,000 bbl. of the gain, and 60,000,000 bbl. of products went to storage during the quarter.

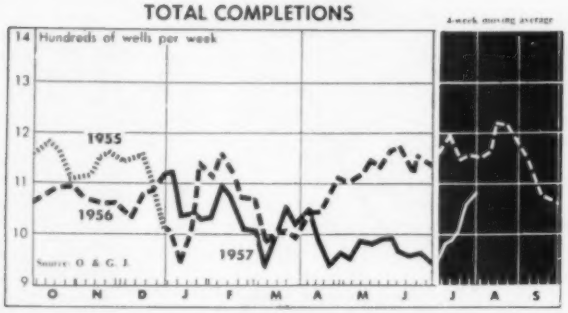
This big second-quarter stock surplus must be corrected through adjustments in supply. Export demand, following the closing of the Suez Canal, emptied some of the tanks that were filled to the brim during the third quarter last year. The industry can't expect another windfall like that this year. Correction will have to come from the supply side.

The influence of stocks on product prices is shown by quotations for gasoline and light fuels. Gasoline stocks have dropped a little below last year. Even though last year's stocks were abnormally high, the adjustment this year has given the gasoline market a firmer tone.

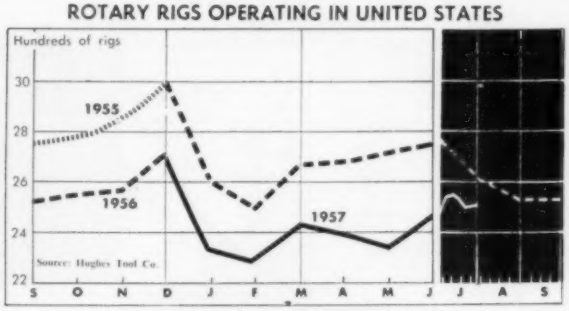
Distillate stocks have been climbing rapidly. Unbranded distributors have withheld summer purchases, expecting further price reductions. No. 2 fuel on the Gulf Coast is selling for about 1.50 cents per gallon below the cargo price for last February.

The barge price for No. 2 fuel in New York Harbor is off 0.4 cent a gallon to 10.25 cents. The current price is 1.4 cents under the 11.65 cents posted after the crude price increase in January.

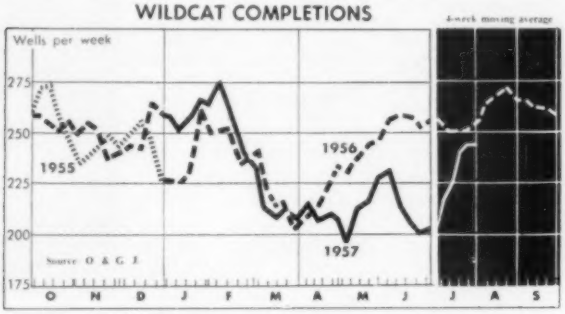
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*
(Thousands of barrels)

Area—	8-5-57	7-29-57	8-6-56
North Central and East	98	101	133
Southeast	40	34	39
Oklahoma, Kansas, Arkansas, Missouri	457	445	420
Louisiana	420	419	450
North and East Texas-Panhandle	350	368	371
Gulf and South Texas	209	179	252
West Texas-New Mexico	545	525	487
Rocky Mountain	281	261	259
Pacific Coast	113	108	109
Total United States	2,513	2,440	2,520
Canada	193	192	238

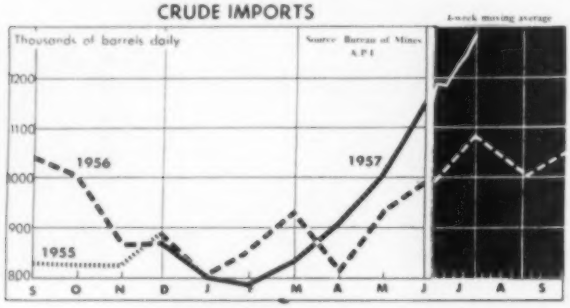
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 3, 1957

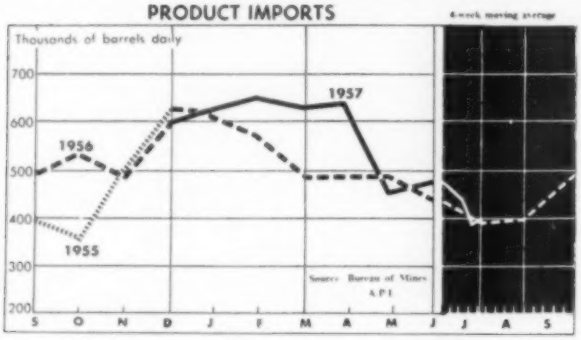
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	2	0	0	0	2	0	4,355	58	‡64	2	0	0	0	2	18	‡30
Arkansas	22	10	0	1	11	1	76,854	628	489	7	1	0	0	6	115	109
California	33	26	0	0	7	0	135,552	1,248	1,301	6	0	0	0	6	309	289
Colorado	19	1	0	0	18	0	96,379	504	706	15	0	0	0	15	342	351
Illinois	49	13	0	0	36	0	123,354	1,424	2,265	17	1	0	0	16	368	438
Indiana	18	4	0	0	14	0	27,579	358	378	8	0	0	0	8	76	82
Kansas	93	33	0	7	51	2	334,987	2,454	3,063	15	0	0	1	14	487	639
Kentucky	39	20	0	2	17	0	60,889	818	1,045	6	0	0	1	5	161	243
Louisiana	67	30	0	9	28	0	435,659	2,221	2,292	13	1	0	0	12	401	449
North	30	15	0	3	12	0	93,479	770	954	7	1	0	0	6	106	145
South	29	8	0	6	15	0	275,023	1,031	1,071	6	0	0	0	6	243	258
Offshore	8	7	0	0	1	0	66,157	420	267	0	0	0	0	0	52	46
Michigan	10	7	0	1	2	0	28,285	237	270	2	1	0	0	1	92	98
Mississippi	4	0	1	0	3	0	44,092	216	264	3	0	0	0	3	114	125
Montana	9	6	0	0	3	0	36,903	228	234	3	0	0	0	3	80	80
Nebraska	22	8	0	0	14	0	130,577	510	611	12	1	0	0	11	287	300
New Mexico	52	27	1	16	8	0	215,211	1,247	1,131	9	3	1	0	5	165	142
Northwest	27	7	0	16	4	0	96,082	487	445	5	2	0	0	3	59	42
Southeast	25	20	1	0	4	0	119,129	760	686	4	1	1	0	2	106	100
New York	9	4	0	0	0	5	9,250	268	.....	0	0	0	0	0	2	.....
North Dakota	3	2	0	0	1	0	22,024	160	145	1	0	0	0	1	66	43
Ohio	39	23	0	7	7	2	89,398	636	589	1	0	0	0	1	7	6
Oklahoma	143	76	0	7	53	7	505,906	3,647	5,145	19	3	0	0	16	415	541
Pennsylvania	15	0	0	11	4	0	100,304	400	†631	0	0	0	0	0	36	†16
Texas	429	243	10	22	147	7	1,828,721	12,852	13,096	81	5	1	5	70	3,201	3,362
District 1	16	6	0	1	9	0	34,634	735	*1,944	6	0	0	1	5	253	*652
District 2	16	6	2	2	6	0	108,483	441	*1,570	3	0	0	0	3	169	*512
District 3	29	11	2	1	15	0	202,888	1,052	.....	8	0	0	0	8	310	.....
District 4	31	9	3	3	16	0	165,707	838	.....	10	0	1	2	7	291	.....
East	23	13	2	0	7	1	93,072	745	652	4	0	0	0	4	228	249
District 7-B	48	21	0	0	27	0	171,781	1,667	.....	14	2	0	0	12	604	.....
West	127	99	0	2	24	2	653,032	3,649	3,416	14	1	0	1	12	530	560
District 9	99	57	0	1	37	4	252,167	2,873	*4,723	18	1	0	1	16	752	*1,319
District 10	40	21	1	12	6	0	146,957	852	791	4	1	0	0	3	64	70
Utah	7	3	0	0	4	0	37,668	115	75	4	0	0	0	4	63	45
West Virginia	12	1	0	9	2	0	33,783	367	378	1	0	0	0	1	18	13
Wyoming	16	8	0	2	6	0	73,903	483	477	5	2	0	1	2	163	135
Miscellaneous (S. D.)	1	1	0	0	0	0	8,824	58	64	1	1	0	0	0	41	56
Total U. S.	**1,113**	546	12	93	438	24	4,460,457	31,137	34,713	**231**	19	2	8	202	7,027	7,592
Total prev. week	1,081	571	11	65	419	15	4,354,438	.....	.....	234	19	2	6	20	.....	.....
Cum. 1957	31,137	16,242	268	2,272	11,699	656	129,649,573	.....	.....	7,027	746	63	274	5,944	.....	.....
Western Canada	61	41	0	6	14	0	260,965	1,812	1,694	17	3	0	4	10	513	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

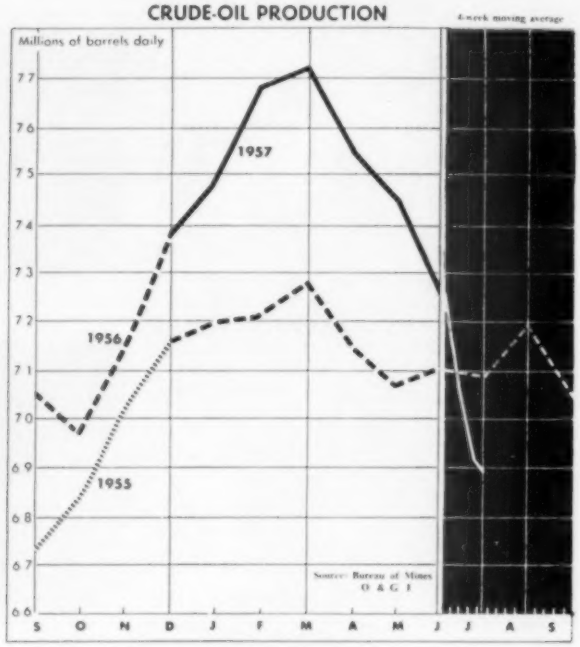
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



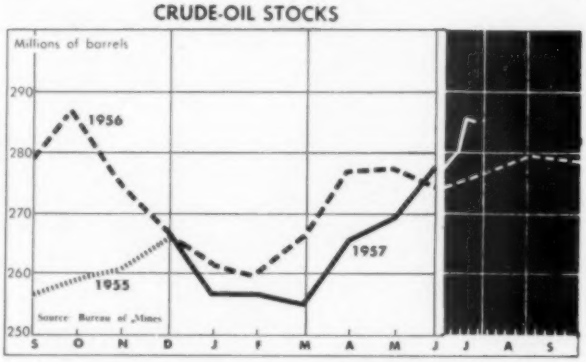
DAILY AVERAGE PRODUCTION FOR WEEK

	August 3, 1957			July 27
	Crude oil	Lease condensate	Total	total
Alabama	13,750	.....	13,750	13,700
Arkansas	85,000	300	85,300	84,400
California	931,700	.....	931,700	930,400
Colorado	153,300	.....	153,300	153,300
Eastern	52,100	.....	52,100	51,300
Florida	1,300	.....	1,300	1,350
Illinois	160,400	.....	160,400	157,800
Indiana	28,800	.....	28,800	28,000
Kansas	†331,600	.....	†331,600	†348,300
Kentucky	39,600	.....	39,600	39,300
Louisiana	773,925	72,500	846,425	871,600
North	122,500	2,500	125,000	127,600
South	651,425	70,000	721,425	744,000
Michigan	24,300	.....	24,300	24,100
Mississippi	108,350	4,400	112,750	114,350
Montana	73,100	.....	73,100	73,450
Nebraska	53,200	.....	53,200	50,300
Nevada	100	.....	100	100
New Mexico	250,500	3,900	254,400	254,400
North Dakota	46,500	.....	46,500	35,000
Oklahoma	†558,100	.....	†558,100	†583,400
Texas	2,746,425	53,700	2,800,125	2,794,700
Dist. 1	51,725	450	52,175	52,450
Dist. 2	126,000	8,450	134,450	134,450
Dist. 3	401,150	26,400	427,550	426,500
Dist. 4	210,000	6,200	216,200	216,100
Dist. 5	36,000	300	36,300	36,300
Dist. 6	122,000	6,300	128,300	128,300
East Texas field	173,000	.....	173,000	173,000
Dist. 7-B	151,000	50	151,050	151,050
Dist. 7-C	140,850	3,575	144,425	143,650
Dist. 8	1,027,275	1,200	1,028,475	1,026,100
Dist. 9	201,850	350	202,200	201,500
Dist. 10	105,575	425	106,000	105,300
Utah	11,900	.....	11,900	9,950
Wyoming	299,000	.....	299,000	289,650
Others	‡100	.....	‡100	‡100
Total U. S.	6,743,050	134,800	**6,877,850**	6,908,950
Change from previous week, down			**31,100**	
Canada	†543,300	.....	†543,300	†568,300

Total U. S. production, January 1-August 3 ..... §1,596,178,850 bbl.
Same period last year (crude plus cond.) ..... *1,545,736,659 bbl.

*Includes 26,876,430 bbl. condensate. †Week ended previous Monday. ‡South Dakota. §Revised.

CRUDE-OIL STOCKS



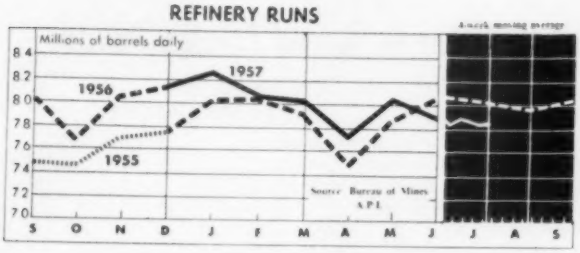
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

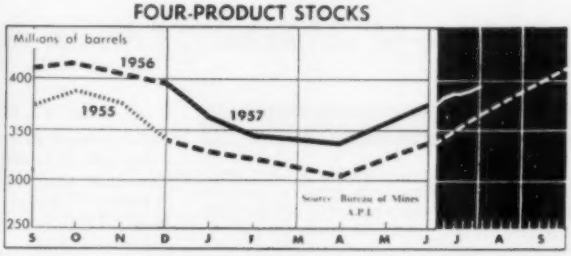
	7-27-57	7-20-57	7-28-56
Pennsylvania Grade	2,994	2,954	2,529
Other Appalachian	1,506	1,503	2,336
Illinois, Indiana, Michigan	11,411	11,133	10,521
Nebraska, North Dakota	2,382	2,621	2,403
Kansas	11,401	11,433	9,712
Oklahoma	22,094	21,147	27,197
Arkansas	3,355	3,499	2,809
Louisiana	19,472	19,454	16,253
North	3,873	3,888	2,601
South	15,599	15,566	13,652
Mississippi, Alabama, and Florida	2,490	2,627	2,976
New Mexico	9,132	8,636	8,162
Texas	128,531	130,490	122,133
East Texas proper	10,097	10,177	8,986
West Texas	62,561	63,801	60,135
Texas Gulf	24,545	24,895	22,275
Other Texas	31,328	31,617	30,737
Wyoming	17,841	17,808	20,137
Other Rocky Mountain	6,654	6,572	7,157
California	29,708	29,348	28,006
Foreign	†16,270	16,657	14,709
Total	285,241	285,882	277,040

*Bureau of Mines. †Includes 3,818,000 bbl. in California.

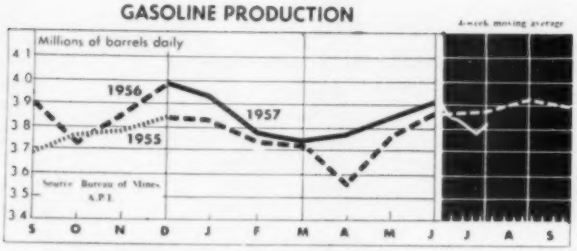
REFINERY RUNS



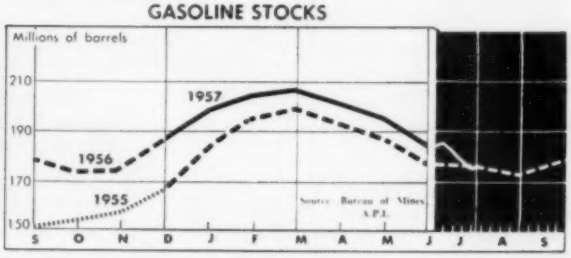
FOUR-PRODUCT STOCKS



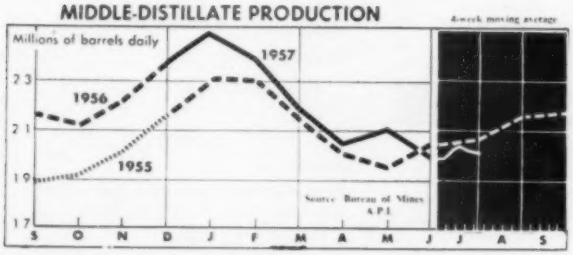
GASOLINE PRODUCTION



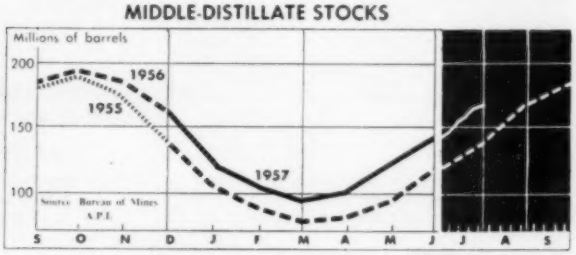
GASOLINE STOCKS



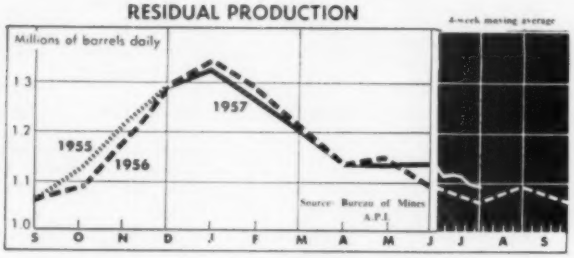
MIDDLE-DISTILLATE PRODUCTION



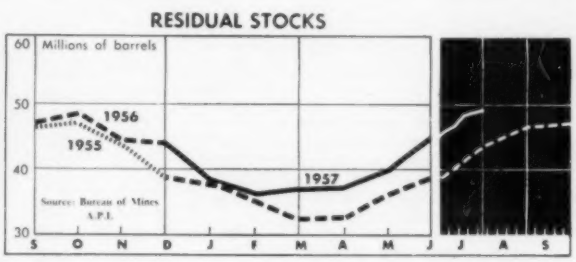
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 2, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,248	532.4	36.0	306.8	228.7	40,758	12,525	49,761	12,049	1,140	492.1	32.6	320.6	181.1
Appalachian:														
District 1	100	44.7	4.9	19.3	4.1	4,464	597	2,806	517	99	38.0	3.3	23.9	5.2
District 2	48	29.3	0.6	6.7	6.9	2,358	602	819	230	106	51.7	4.9	17.1	12.6
Ind., Ill., Ky.	1,283	670.2	64.0	263.3	154.7	30,970	6,136	19,888	5,835	1,407	739.5	72.6	286.2	150.2
Minn., Wis., Dak.	104	48.0	8.1	27.0	8.9	5,441	1,397	6,815	429	70	34.8	6.2	19.3	3.8
Okla., Kans., Mo.	719	413.7	12.0	167.0	35.3	14,751	1,669	12,217	1,065	703	375.5	15.4	167.3	29.8
Inland Texas	291	215.1	8.3	45.4	20.0	6,754	422	2,606	1,901	274	202.2	5.9	52.7	25.1
Texas Gulf Coast	1,918	908.7	97.0	462.6	232.3	23,809	3,379	16,031	7,206	1,966	948.9	111.7	498.2	241.1
La. Gulf Coast	665	373.6	50.7	145.3	43.1	10,796	3,339	6,966	1,670	714	361.2	47.9	196.3	55.1
N. La. and Ark.	87	29.3	4.1	21.7	4.6	3,959	759	2,239	145	103	38.0	5.0	24.2	6.9
Rocky Mountain:														
New Mexico	28	13.6	0.7	5.4	3.0	433	14	125	74	26	13.5	0.2	5.1	3.4
Other Rocky Mtn.	282	133.7	1.4	58.3	37.7	6,345	270	3,132	1,023	281	129.8	3.7	61.4	33.5
California	1,163	504.4	4.3	159.6	300.8	25,522	345	14,667	16,799	1,106	497.1	4.0	166.7	343.3
Aug. 2, 1957	7,936	3,916.7	292.1	1,688.4	1,080.1	176,360	31,454	138,072	48,943	7,995	3,922.3	313.4	1,839.0	1,091.1
July 26, 1957	7,763	3,793.7	270.6	1,702.9	1,109.1	175,698	30,611	133,822	48,737	.....	.....	.....	.....	.....
Aug. 3, 1956	7,964	3,863.6	264.9	1,834.4	1,079.7	177,561	29,415	119,289	44,598	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.25-11.75
Premium (98 octane)	14.00-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
★ Regular (88 octane)	13.1-13.6
Premium (96 octane)	15.1
★ Premium (98 octane)	15.8-16.2
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
★ Kerosine 41-43	10.75
★ Distillate No. 2	10.25
★ Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
★ Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.85-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$3.05
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Carib.-Montreal, clean (USMC—40%)	$2.43
★ Gulf-U.K., clean (Scale—20%) (30s. 9d.)	4.31
★ Carib.-U.K., dirty (Scale—30%) (22s. 9d.)	3.19
★ P.G.-U.S.N.H., dirty (USMC—55%)	5.72

SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

GASOLINE

	Total demand	Refinery production	Stocks end of period†
July 1957*	4,280	3,800	176,170
June 1957*	4,250	3,910	188,000
May 1957	4,114	3,832	194,770
August 1956	4,166	3,922	172,939
July 1956	4,018	3,878	176,536

KEROSINE

July 1957*	170	260	31,210
June 1957*	150	265	28,400
May 1957	147	272	25,545
August 1956	225	313	31,826
July 1956	207	296	28,990

DISTILLATE

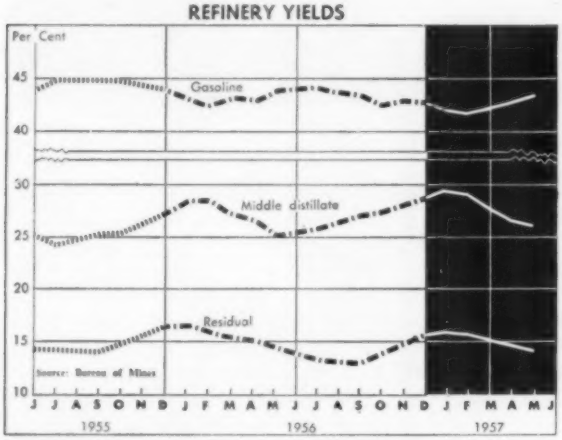
July 1957*	1,105	1,750	136,860
June 1957*	1,080	1,750	115,500
May 1957	1,185	1,789	98,135
August 1956	1,144	1,839	137,905
July 1956	1,076	1,767	115,787

RESIDUAL

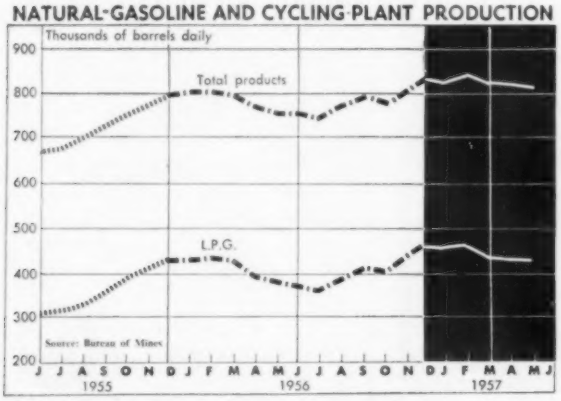
July 1957*	1,360	1,095	48,880
June 1957*	1,423	1,135	44,800
May 1957	1,459	1,103	41,125
August 1956	1,358	1,091	46,617
July 1956	1,606	1,066	43,958

*Preliminary. †Thousands of barrels.

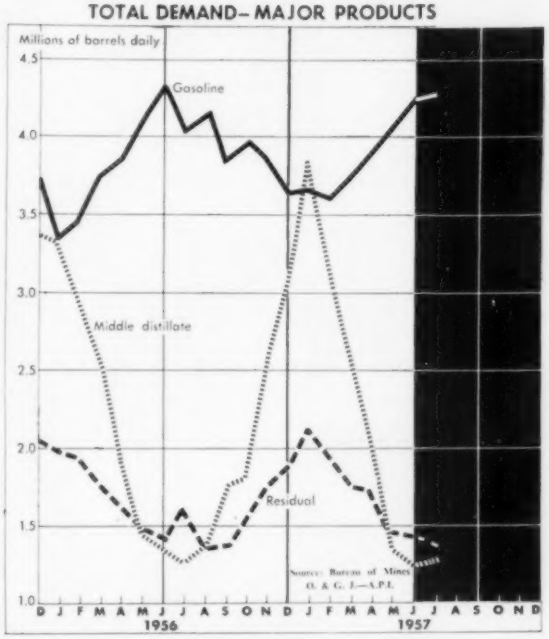
REFINERY YIELDS



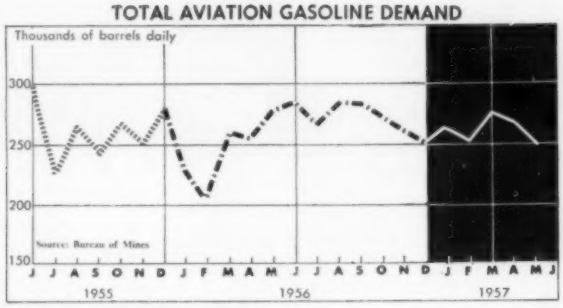
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



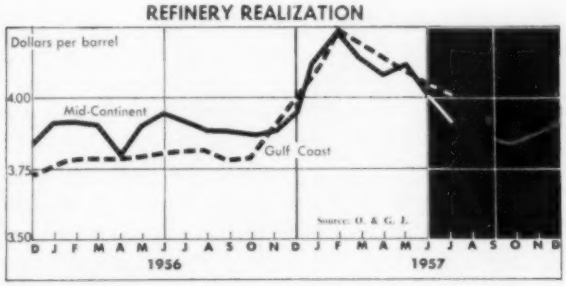
TOTAL DEMAND—MAJOR PRODUCTS



TOTAL AVIATION GASOLINE DEMAND



REFINERY REALIZATION



REFINERY REALIZATION

	July* 1957	June* 1957	May 1957	July 1956
Mid-Continent	$3.90	$4.03	$4.14	$3.92
Gulf Coast	4.01	4.05	4.10	3.81

*Preliminary.

Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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CRAWFORD H. GREENEWALT,
President, E. I. du Pont de Nemours & Co., Inc.

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PRODUCTION WANTED

PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

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Box K-301, The Oil and Gas Journal, Tulsa, Oklahoma.

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available for installation of Gas Compression or Injection Plant on proven property. Installation would be completed without producer financial participation and leased for operation. Might consider part ownership.
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FOR SALE at Oil Hill, Kansas. Attention C. W. Schwenker, one used model QS-V8 Cardwell skid type well servicing unit powered by V-8 motor—$850.00, mounted on 1947 2-ton Chevrolet long wheel base truck with oilfield body—$750.00. Take both $1500.00. No tools or pole. Cities Service Oil—Patridge—Bartlesville.

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Three compartment approximately 12 ft. x 44 ft. x 25 ft. high with three 4-ft. diameter x 34 ft. high stacks with manual operated dampers and equipped with one hundred twenty-two 4-in. x 5-in. x 30-ft. steel main coil tubes approximately half of which are 5 and 7% chrome and nine 4-in. x 5-in. x 30-ft. carbon steel superheated steam coils. One hundred twenty-nine 5-in. x 10-in. return bends and four terminal fittings, original estimate of 98,000 lb. steel work. 700 cu. ft. "Panelag," 500 cu. ft. insolcrete, 1380 lb. insulclad, has steel wind box and equipped with Coppus Dennis DA-13 Fanmix burners, Fahrite tube sheets and furnace fittings. Very good condition. Ceco Service Co., P. O. Box 65, Aurora 8, Colo.

FOR SALE EQUIPMENT

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GAS BOOSTER, Skid Unit, good V-12 Climax and Fuller C-110 Rotary Compressor. W. J. McMeans, Marietta, Oklahoma.

1 36L BUCYRUS Spudder complete with 5 and 7 inch tailing in tools. Dog house, butane tank, junk rack and light plant. Rod and tubing tools and hand tools. Phone Office 144, Res. 614, Cleveland, Oklahoma.

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FORMER LACY REFINERY
1—Wyatt 30" x 70" Stabilizer 160# 30 tray
1—5' x 96' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
9—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS
2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks, 50#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 350#, 24" x 28'.

HOT-OIL PUMPS
3 Pacific ITB, 400 gpm.—2,000' hd. 735 gpm—3,100' hd.
5 Pacific SVTB, 612 gpm—600' hd. 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—400' Hd.
8J hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS
4—Kellogg Adm. Ftg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Steel Ftg. Hed. 800, 630, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome
5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 180-1000 Sq. Ft.

COMPRESSORS
1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

MISCELLANEOUS
6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
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FOR SALE—Cardwell Spudder. In good condition, both looks and operation. Complete with all tools. Priced right. K & A Drilling Co., Phone 448R, Box 497, Ellinwood, Kansas.

N-4 BREWSTER Rotary Rig complete—GMC Twin 6 Diesel Motors—Lee C. Moore double derrick—Gardner-Denver Mud Pump, skid mounted with GMC Twin 6 Diesel Motors—4½" Drill Pipe. Write L. C. Smitherman Drilling Company, P. O. Box 627, Augusta, Kansas, or call 1330—Augusta, Kansas.

FOR SALE: Rotary Rig Complete with National T-20 Drawworks single powered by WAK Waukesha Engine. 87' Lee C. Moore Jackknife. 7½" x 14" Oilwell Pump single powered by LeRoi L-3000 V-12 engine. 5000' of good 4½" drill pipe. 5 Drill Collars and all necessary equipment to complete rig. Call or write Travis Drillers, Inc., P. O. Box 1097, Austin, Texas. Phone GR 7-7725 or GR 8-5044.

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2. 6 power cylinders 9¾ x 10½; 2 comp. cylinders 5¼ x 10½, 1500 PSIG WP. Provision for third comp. cylinder, if needed.
3. Complete with air starting equipment, lube oil filters & coolers, Woodward hydraulic governor, low tension, explosion proof ignition, Maxim silencer, cyl. hd. & exhaust pyrometers, pipe fittings and plumbing. Will mount on heavy duty steel skids.

   IN STOCK—PRICE F.O.B. OKLA. CITY, INCLUDING SKID, $35,000.00.
4. Can furnish and mount engine jacket water cooler and/or gas intercooler and aftercoolers to fit your application. Price on request. Other compressor cylinders available. Deduction if skids not required.

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Suitable for Process or LPG Storage
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ELECTRICAL ENGINEERS

Opportunities for graduate engineers in United States and abroad.

For instrument engineers, prefer 3 to 5 years experience in application of instruments on pipe lines, refining or petro-chemicals. For electrical engineers, prefer experience in design of oil and gas pipe lines. Salary in accordance with qualifications and experience. Replies strictly confidential.

PIPE LINE TECHNOLOGISTS, INC.
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SENIOR DRILLING ENGINEER

Required by the National Iranian Oil Company to take charge of the drilling section of their Production Operations Division.

The applicant who should be a qualified engineer or technician, should have had long experience of the drilling of high pressure wells from 5,000 to 15,000 feet in depth and of high capacity well completion methods. He should also be familiar with oilfield developments from high capacity high pressure producing wells and with keeping records, drawing up drilling contracts, and office routine.

The drilling operations will normally be carried out by contractors or subsidiary companies and the applicant will be required to record these activities and assure the Director responsible for Production Operations that they are being carried out efficiently and economically. A good knowledge of modern drilling machinery and equipment is essential, and sound ideas on standarization and on drilling administration is required.

The successful applicant will be based in Tehran, which has a good climate, and a married man may bring out his family after three months from first arrival in Tehran. Contract for two years, extendable by mutual agreement. The position is one of responsibility, requiring a wide technical background, and provided the applicant is healthy and energetic an older man may be considered. Minimum experience 15 - 20 years.

In addition to a basic salary an adequate local allowance will be paid whilst the official is in Iran. Usual Oil Company leave and travel arrangements. Reply giving full details of past experience and salary to

National Iranian Oil Co.
Exploration and Production Department
Ave. Khabir (Ave. Villa Shemali)
Tehran, Iran.

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FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs, $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

PRODUCTION ENGINEER—For position with large Independent Company operating primarily in Kansas and Oklahoma. Great Bend, Kansas location. Five to ten years experience to qualify. State qualifications and give salary requirements. Box K-294, The Oil and Gas Journal, Tulsa, Oklahoma.

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PRODUCTION ENGINEER OR SUPERINTENDENT
Required by the National Iranian Oil Company

A qualified Engineer who has had a broad experience of high pressure large capacity wells from limestone fields. Experience of multistage separators and the handling of high wax content crude an advantage. Must have had experience of the construction of production installation. The successful applicant will be required to assist and train Iranian assistants. Applicant will be based in Tehran, which has a good climate, and a married man may bring out his family after three months from first arrival in Tehran. Contract for two years, extendable by mutual agreement. The position is one of responsibility, requiring a wide technical background, and provided the applicant is healthy and energetic an older man may be considered. Minimum experience 15 - 20 years.

In addition to a basic salary an adequate local allowance will be paid whilst the official is in Iran. Usual Oil Company leave and travel arrangements. Reply giving full details of past experience and salary to

National Iranian Oil Co.
Exploration and Production Department,
Ave. Khabir (Ave. Villa Shemali)
Tehran, Iran.

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has positions open for

GEOPHYSICIST with B.S. or M.S. degree in related field and at least 7 to 10 years experience in seismic crew supervision, data interpretation, and operation of magnetic play-back systems.

GRAVITY INTERPRETER with B.S. or M.S. degree in Geology and at least 10 years experience in the reduction and interpretation of gravity surveys in the Mid-Continent Area.

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GEOPHYSICISTS
(South America)

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Forward personal data and college transcript to: Box K-249, The Oil and Gas Journal, Tulsa, Oklahoma.

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Must have an excellent knowledge of reservoir engineering in limestone fields, with estimation of reserves and production control. Must be able to supervise a petroleum engineering and simple chemical laboratory. The successful applicant will be required to assist and train Iranian assistants.

Applicant will be based in Tehran which has a good climate and can bring out his wife and family after a period of three months from first arrival in Tehran. Contract for two years, extendable by mutual agreement. The position is one of responsibility, requiring a wide technical background, and provided the applicant is healthy and energetic an older man may be considered. Minimum experience 15 - 20 years.

In addition to a basic salary an adequate local allowance will be paid whilst the official is in Iran. Usual Oil Company leave and travel arrangements. Reply giving full details of past experience and salary to

National Iranian Oil Co.
Exploration and Production Department,
Ave. Khabir (Ave. Villa Shemali)
Tehran, Iran.

SITUATIONS WANTED

GEOLOGIST—Age 33, nine years major company experience in surface, operational, and general subsurface geology, mostly in a supervisory capacity. Desire position in Tulsa, Oklahoma with an aggressive independent or major. Willing to travel to areas where consulting work is needed. Venezuelan experience. Box K-290, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST-GEOPHYSICIST: Eight years major company experience in integrated geological geophysical program. Desires position as geological geophysical coordinator with an aggressive company. Box K-297, The Oil and Gas Journal, Tulsa, Oklahoma.

GRAD. MECH. ENGR. Six years experience production, workover, gas & water inj. Resume on request. Prefer Ark.-La.-Tex. area. Box K-296, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 8 years Oklahoma and Kansas subsurface experience with major. Masters degree. Desires change. Box K-299, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT - ADMINISTRATIVE. Degree, 31, married, 8 years contractor/producing company experience. Responsible; corporate records, financial statements, joint billings, administrative procedures, land records. Post Office Box 574, Dallas 21, Texas.

GEOLOGIST—10 years oil field experience, domestic and foreign. Very aggressive, capable and willing to relocate. Consider anything legitimate. References on request. P. O. Box 366, La Habra, California.

LEASE AND DRILLING BLOCKS

TWO OLD shallow leases, can be reconditioned profitably. Carl Johnson, Half Way, Ky.

SUBLETTE CO., Wyoming, 33 N., 109 W., 160 acre federal oil lease available. Dick Sellars, 755 Brookline St., Atlanta 10, Ga.

LEASE FOR SALE: Chautauqua county, near Sedan, Kansas. 16 wells, production from Peru sand, 1250 ft. deep. 9 producing. 4 on pumping units, balance on rod lines. B. B. Jamison, Madison, Kansas. Phone 80 W.

OIL AND GAS MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-7, Colorado Bldg., Denver 2, Colo.**

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HIGHEST PRICE PAID for oil and gas income royalties, overrides, oil properties. A. S. Berry, 520 Wright Bldg., Tulsa, Oklahoma.

WE WILL BUY your producing Royalties, Overrides, Oil and Gas Producing Properties. Ben H. Williams—Clarendon, Texas. Wiltex Oil Company.

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Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

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MANUFACTURER'S REPRESENTATIVE wanted to sell line of plastic tapes for protective pipe wrapping and electrical insulation to the oil and gas industry. Exceptional products that will assure excellent profits. You will be backed by an aggressive national advertising campaign and generous technical assistance. Reply Box K-298, The Oil and Gas Journal, Tulsa, Oklahoma.

SERVICES

THE ALASKA SCOUTING SERVICE
Bi-weekly reports on All-Alaska Exploration. Address: John R. Roderick, Box 2278, Anchorage.

EQUIPMENT MEN . . . in the News

Schlumberger Appoints Three to Sales Posts

J. A. (Pete) Mullinax has been appointed division sales manager for Schlumberger Well Surveying Corp.'s Rocky Mountain region with headquarters in Denver. M. N. Henderson is now sales manager for the Northeast division with headquarters in Evansville, Ind., and W. T. McCord, formerly field engineer at Corpus Christi, is now serving there as sales engineer.

Mullinax most recently was in the company's headquarters in Houston in both the sales and personnel departments. Prior to that, Mullinax was manager of the district office at Farmington, N. M.

Reynolds Metals Names Beeler to Sales Post

L. S. BEELER

L. S. Beeler has been named as assistant manager of chemical and petroleum market sales for Reynolds Metals Co., according to Keith E. Hall, director of industrial markets. Beeler has been chemical products supervisor for Reynolds for the past 5 years. In his new position, he will assist W. B. Moore, manager of the firm's chemical and petroleum market.

Reynolds' aluminum oil-country pipe is being used for temporary water and gas lines for drilling rigs and also is finding use in permanent-type installations such as tank and battery hookups.

Elliott Names Campbell as Kansas City District Mgr.

H. J. Campbell has been appointed Kansas City district manager for Elliott Co., Jeannette, Pa. Campbell joined Elliott in 1943 after considerable engineering and commercial experience. He was originally assigned to the company's Chicago district office and has been in the Kansas City office since 1948.

Welex Names Hendricks, Coward to Sales Posts

C. D. Hendricks has been named sales engineer for the Farmington, N. M., district of Welex Jet Services, Inc., and James H. Coward, Jr., has been promoted to sales engineer in the Beaumont district, according to J. B. Vaughan, vice president of sales.

Hendricks has been in oil-field service work for 9 years, starting as roughneck and later working as tool dresser, driller, roustabout and wireline operator. Coward worked as a perforator operator and has been in oil-field service work 11 years.

Blake Heads Rocky Mt. Area for Southern

E. F. BLAKE

Elmer F. Blake has rejoined Southern Geophysical Co. as vice president in charge of Rocky Mountain operations with headquarters in Denver. According to Dr. Sidon Harris, president, Blake will direct all Southern seismic, gravity and core-drilling activities in the area.

Blake was previously with Southern for 5 years before resigning in 1954 to enter business for himself as consulting geophysicist, seismic and core-drilling contractor of Denver and Grand Junction, Colo.

Bethlehem Supply Will Open New Utah Store

In September Bethlehem Supply Co. will open its first new store in Utah at Blanding. The store primarily will serve the rapidly developing Paradox basin of Southwest Utah as well as the entire northwest portion of San Juan basin in the Four Corners area.

D. W. (Wayne) Crossan will be in charge of the store operation, and J. C. McDaniel will be in the store. The store is in Bethlehem's Panhandle western district and will be under the supervision of E. R. Phillips, district manager at Amarillo, Tex.

Tex-Vit Promotes Clemens To Ass't. General Manager

David E. Clemens has been promoted from general sales manager of Texas Vitrified Pipe Co., Mineral Wells, Tex., to assistant general manager, according to J. F. Bailey, secretary and general manager of the firm.

Clemens will be responsible for sales supervision, in addition to assisting with other management duties. He joined the Tex-Vit organization in 1947, starting as a business office clerk. He was promoted to traffic manager and to assistant sales manager, before being named general sales manager in 1952.

The company is currently completing the construction of a new office addition at the plant site east of Mineral Wells. It will be occupied by executive and administrative personnel of Texas Vitrified Pipe Co. as well as its wholly owned subsidiary, Southwestern Plastic Pipe Co., and its associated company, Tex-Vit Supply Co.

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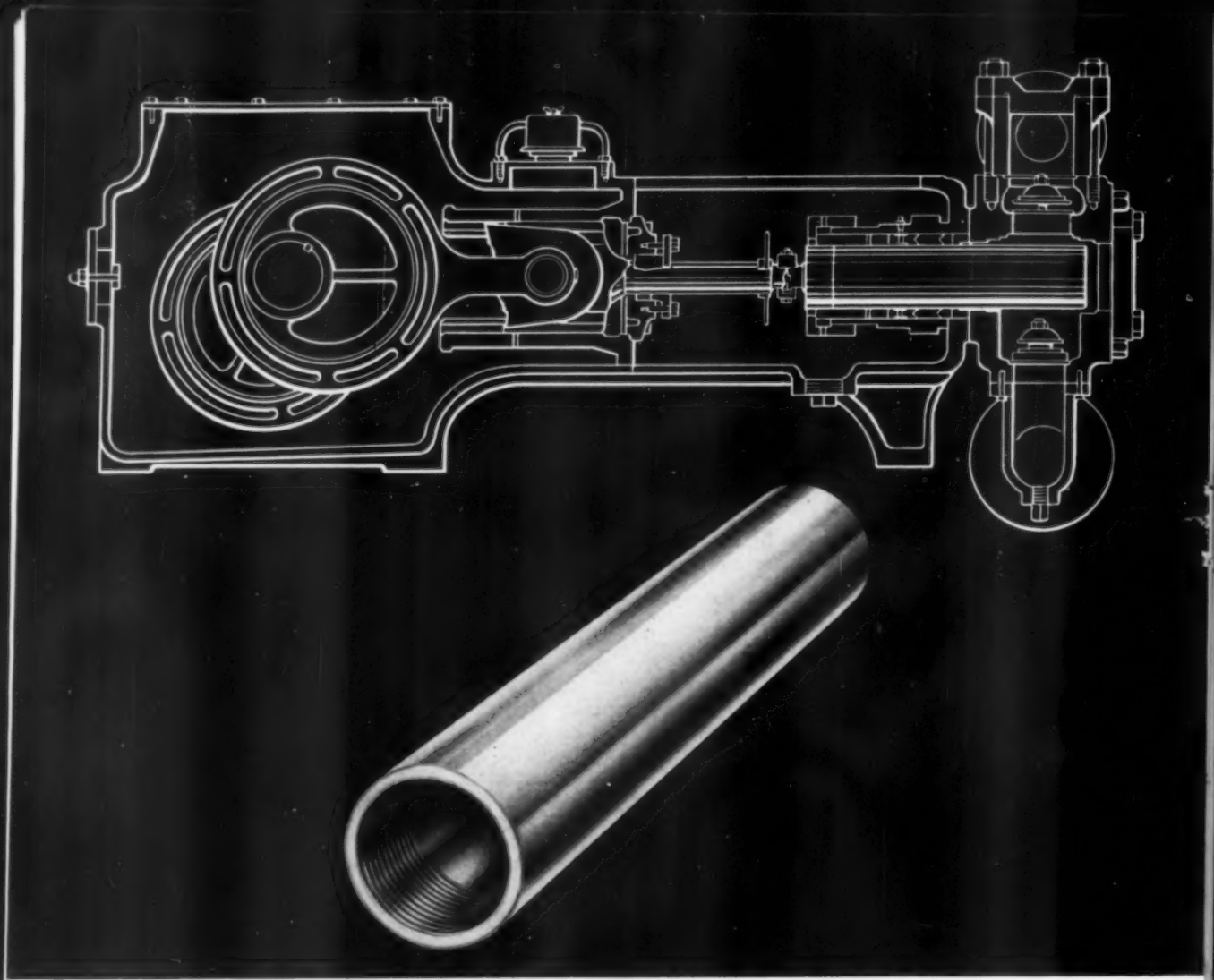
LEGAL

SEALED BIDS will be received until 2:00 P.M., Mountain Standard Time, August 28, 1957 and opened at that time in the Office of the Superintendent, Blackfeet Indian Agency, Browning, Montana, for the leasing of 9,673.27 acres of Tribal land and 1,509.15 acres of allotted Indian land located in Townships 31 North, Range 5 West; 32 North, Range 5 West; 34 North, 6 West; 36 North, Range 8 West; 36 North, Range 9 West and 37 North, Range 6 West, Glacier County, Montana, for oil and gas leasing purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Blackfeet Indian Agency, at Browning, Montana.



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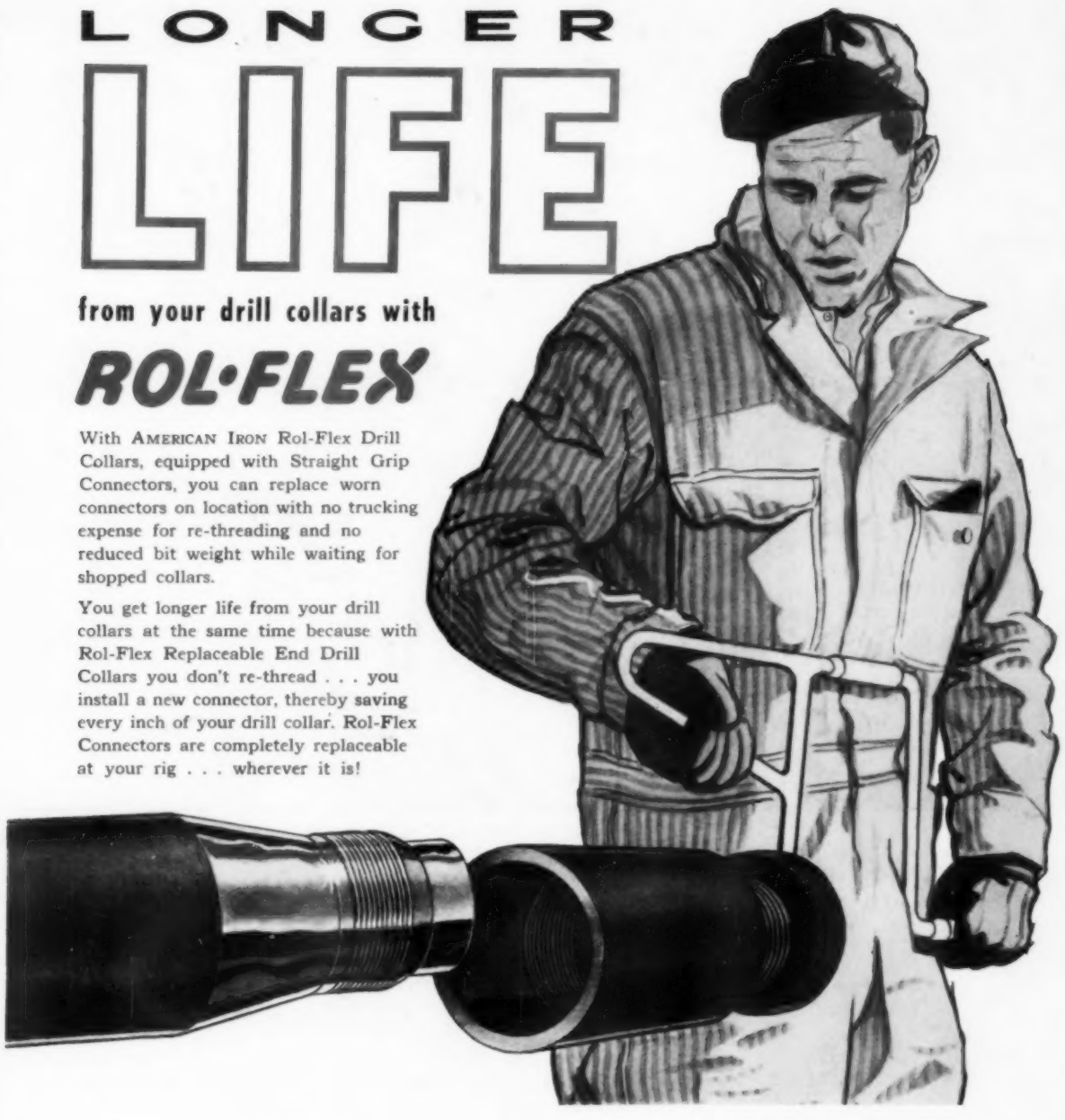

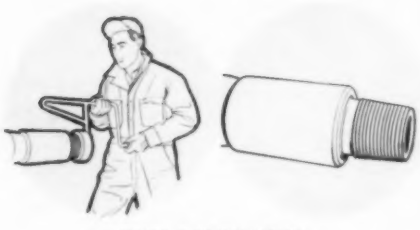

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